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(Govt of West Bengal)

Economic and social aspects of educational planning

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Foreword

This handbook deals with the economic and social aspects of educational planning, a subject which is topical, important, and a relatively new field of study. A closer understanding of these issues is essential to the task of integrating educational plans with economic and social development, a task which is facing the governments of both the developing and the more developed countries.

The present volume consists of contributions by economists, educators, sociologists, demographers, statisticians, and administrators engaged in the day-to-day tasks of educational planning, for whose contributions I express the gratitude of Unesco.

I commend this handbook not only to scholars, specialists and students, but to the many consultants and experts who, on behalf of Unesco or on any other basis, are assisting developing countries throughout the world in seeking solutions to their problems of social and economic development. I believe they will find it of service.

October 1963

RENÉ MAHEU
Director-General

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Introduction

From the economic and social standpoint, a country's educational system is its main means both of perpetuating the values and skills of its population, and of preparing it for the changes which progress requires. At the same time educational systems are products of the societies in which they operate. They depend on the prevailing social structure and the cultural goals of the population, on the demands for and status accorded to different occupations, on the size of the nation's budget and its fiscal capacity, and on its general political and administrative system.

Educational planners usually find themselves confronted by an existing educational edifice combining elements of both the old and the new. An archaic educational system cannot be scrapped and rebuilt from the ground in a year or two; and there is a complex interrelation between different parts of the structure. Changes in educational systems have to be brought about by a set of policies spread over time, with careful regard being paid both to the priority needs of individual sectors and the evolution of the system as a whole.

As the handbook is concerned with the economic and social aspect of educational planning, educators will miss discussion of many themes central to the theory and practice of education which are of a political, philosophical, and humanistic nature, or which concern educational administration rather than planning. Planning is concerned with setting up an effective system for utilizing resources to their best advantage to serve given ends. These ends, which are political, social, cultural, humanistic, and moral, are given to the planner by the statesmen and politicians whom they serve, and are not the planner's own creation. Thus the planner is primarily concerned with the problems of means rather than ends, and is required to engage in exercises of quantification, in the study of consistencies between goals, and in organizing the achievement of specific targets. For this reason the science of development economics, dealing as it does with the optimum use of resources for given ends, plays a major role in planning. This analysis, although economic in the sense of drawing upon the techniques of economic science, has, of course, also to embrace the social factors to be introduced into plans, insofar as they can be quantified or ranked, and when they require scarce resources which have alternative uses.

Our concern with the relatively new subject of the planning of education in its economic and social aspects does not mean that Unesco, in publishing this handbook, is in any way underestimating the humanistic, philosophical, and cultural problems of education, or those of educational administration. While, for instance, it is the task of the planner to estimate the number of places required in secondary schools and the types of training required to pursue economic and social objectives incorporated into development plans, it is for the educator to determine curricula and educational practice and to set the standards which will ensure the development of the human personality, the appreciation of human rights and of other values held by society. These matters are dealt with in another and wider field of literature. The present volume is intended to fill a gap in a narrower but very topical and challenging field of study.

The inter-war period saw international concern centred round the problem of maintaining world stability with the threat of economic recessions and of violent political change always present. The post-war period saw it concentrated upon development, the new threat being the growing dualism in world society between the countries which were advanced in the development process and those which were in its earliest stages or stagnant because of their political or social history, or because of lack of resources and infrastructure for economic progress, material and technological.

Research into the development process, stimulated by this international concern, showed that education stood along with physical capital and technological progress as a powerful and indispensable means of achieving development. Education began to absorb an increasing part of the public expenditure of developing countries and of international funds allocated for economic development, leading to the position reached today, in which most of the developing countries are raising sharply the level of their expenditure on education, while Unesco administers a fifth of the United Nations Special Fund, and 18 per cent of the total technical assistance programme of the United Nations and Specialized Agencies, for economic development.

Three landmarks in this process were: the resolutions of the Unesco General Conference of December 1960 which for the first time treated education as a factor in economic development in addition to being a cultural and social force; the decision of the International Bank for Reconstruction and Development announced at its General Assembly in September 1961 that it would be prepared through the International Development Association to entertain applications for loans and credits for education as part of economic development; and the granting in November 1962 by the IDA of the first international credit for education.

During the 1961-62 programme period Unesco sent out twenty-five missions consisting of economists and educators to advise countries on educational planning and in a number of cases, on the preparation of educational projects suitable for international financial aid. It is operating a system of international aid for educational planning by means of expert advisory services, and is sponsoring in co-operation with IBRD and the Ford Foundation an International Institute of Educational Planning in Paris, and Educational Planning Institutes in various regions of the world.

To aid countries in setting educational targets and in the complex task of relating these to their plans for economic and social development three regional conferences, in Africa, Latin America and Asia respectively, were organized by Unesco. These conferences brought together educators and financial authorities and set realistic targets which took into account both educational and economic development needs, thus breaking new ground in the history of international co-operation. These conferences and the conclusions and action flowing from them, and the sending out of advisory missions, as well as the establishment of regional institutes to promote the spread of knowledge in this field, led to the demand for the present publication. Many of the problems dealt with are in their initial stage of analysis, and material such as that in the present work is bound to be revised from time to time as research in this new and important field goes forward. There is already however a pressing need to bring together what is already known on this subject. It is not yet possible to obtain a consensus as to the best methods of approach. For this reason we have not attempted to produce an 'integrated manual', but offer the reader a description of the principal different approaches which are being, or could be, used in a variety of countries.

The contributors are specialists working in this field both inside and outside the Secretariat of Unesco and the views expressed by them in this capacity are not necessarily those of Unesco.

Chapter I

Education and development

by H. M. Phillips, Director, Analysis Division,
Social Sciences Department, Unesco

This chapter opens the discussion of how education can best be related to economic and social development. It begins by discussing the notion of development, and sets out certain special characteristics of education which have to be taken into account in economic analysis. A section follows on the social factors affecting educational planning. Since planning involves making the best choice between alternate paths of action, there follows a brief discussion of what are in fact the major areas of choice open in educational planning, and what are the key policy questions. This is followed by a summary of the different techniques of incorporating education with development planning, which are in use or recommended by different authorities, a number of which are set out in detail in subsequent chapters by other contributors. It is then suggested that the problem can usefully be divided into thirteen main points of analysis. These points are set out, and followed by a section indicating various criteria and norms which may be applied in situations where the data and administrative mechanism required for detailed planning is absent. A section follows on educational expenditure, cost and financing, and another on allocations to education. A final section discusses the problem of assessing the returns from investment in education.

The notion of development

'It should no longer be necessary to speak of economic and social development since development—as distinct from growth—should automatically include both. Development is growth plus change; change in turn is social and cultural as well as economic, and qualitative as well as quantitative.' These views, taken from the report of the United Nations Secretary-General on the Development Decade[1] are shared in the present paper. The conception is not a new one, though it has been often forgotten. At the turn of the century Alfred Marshall was saying:[2] 'I think that in the later stages of economics better analogies are to be got from biology than from physics; and, consequently that economic reasoning should start on methods analogous to those of physical statics, and should gradually become more biological in tone.' He went on: 'Progress or evolution, industrial and social, is not mere increase and decrease. It is organic growth, chastened and confined and occasionally reversed by the decay of innumerable factors, each of which influences and is influenced by those around it.' He concluded that 'The Mecca of the economist is economic biology rather than economic dynamics.' Nevertheless the elimination of the distinction between economic and social development, although in theory desirable, is not yet feasible at the working level, since the distinction is well established (even if on dubious assumptions) in national accounting practice, in ordinary speech (as it is in the title of the Economic and Social Council of the United Nations itself) and in current teaching and research in the different disciplines.

The thought in the Secretary-General's report quoted above is particularly applicable to the development of education, economic and social factors being closely interwoven in this field. Education is one of the rights included in the Declaration of Human Rights of the United Nations. The expression 'right' in the sense of something which can be enforced, and which someone has an obligation to enforce, has a clear meaning in a juridical context. Thus 'the right to education' comes into effect when there is a school in a village and someone refuses admission to a child to the school facilities. By simple process of law the child's right can be established and the matter be remedied immediately. If, however, we have the situation, alas too prevalent in the developing countries, that the village has no school, no hospital facilities available, a polluted water supply, and no employment opportunities available to the villagers, the situation is quite different. The statement that education is a human right in such circumstances is no more than an exhortation. It is equivalent to the statement 'universal primary education is of extreme importance and must be one of your priority objectives'. The reason is that there are not enough resources to satisfy all of the claims which are advanced as 'rights'. The problem becomes one of choice in the use of resources and moves from the sphere of jurisprudence into that of economics, politics and social programming.

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[1] 'The United Nations Development Decade. Proposals for Action', *Report of the Secretary-General, 1962*, p. 3.

[2] A. C. Pigou, (ed.), *Memorial of Alfred Marshall*, New York, Kelley and Millman, 1956, 518 pp.

In a narrow sense, economic development plans aim at raising national income per head and developing productive capacity. In the wider sense, their task is to raise levels of living, which is a more complex matter. Social development plans in the narrow sense are those which make State or corporative provision for the essential living levels of people with insufficient incomes. In a wider sense they include ways of creating those social structures, value systems and incentives which favour economic and social progress. In a still wider sense they carry out the aims and needs of society as a whole and we arrive at the concept of over-all development. The United Nations Statistical Commission has suggested[1] nine major components of a satisfactory index of levels of living: health; food consumption and nutrition; education; employment and conditions of work; housing; social security; clothing; recreation; human freedoms. The last two are difficult or perhaps impossible to measure. Development also means the widening of the effective area of choice open to individuals and to societies as to how they spend their daily lives; and the pursuit of moral objectives; and the promotion of various types of culture, as distinct from recreation, are also development ends. Education systems have a profound impact on economic and social development in all of the above senses of this term, and should therefore never be regarded as purely economic or purely social phenomena.

Development is a relatively new concept. The economic and social changes which brought about modern society have been packed into the last 200 years out of 3,000-4,000 years of civilization. This is reflected not only in the indices of economic growth but in population figures. From the beginning of the Christian era to 1750 the world population is believed to have grown at 7 per cent per century. After 1750 it grew at 85 per cent. It is not surprising, therefore, that education has long been the means employed by societies to perpetuate their way of life, civil organization, and value systems, rather than to develop them. The country which was earliest in obtaining economic development in a modern sense, the United Kingdom, did so without an early introduction of universal education. By 1850, in the United Kingdom as in France, half the population was illiterate, although remarkable economic growth had been achieved in the previous period. Other countries which came to the fore later in the industrial field (United States of America, Germany, Japan) introduced compulsory universal education at an earlier stage in their own development process, partly no doubt from the fact that they started later. In the late nineteenth and early part of the twentieth cen-

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1. United Nations Publication E/CN. 3/179 – E/CN.5/299, New York, 1954.

tury the Russian Empire experienced considerable industrial development but had a poor record as regards universal education.

The social consequences of the unequal spread of education in the United Kingdom in the middle of the last century are well known. They were part of the problem of the 'two nations' within a single country which troubled Disraeli and the politicians of that age, who were faced with the possibility of the development of a dual society at the same time that economic growth was attaining a high pace. It would not be appropriate here to discuss the social mechanisms of adjustment by which this was avoided and the modern 'unitary' welfare State was created in Western Europe by one set of measures; and later in Eastern Europe by another. In both types of society the extension of universal education to cover the whole of the population, and the creation of educational ladders was fundamental to the structure and development of the State. Clearly there are lessons from this historical process for newly developing countries facing the task of building up well organized societies, and for these countries which still, for historical and material reasons connected with their development, preserve features of a dual society.

In respect of education, the world itself is a dual society. While the developed countries have practically abolished illiteracy there are 700 million illiterates in the developing countries and their number is increasing because of population growth, although enrolment ratios are improving considerably. While the developed countries have achieved 100 per cent enrolment of their school-age population (5 to 14 years), in the developing countries the percentage often falls below 50 and the median is just under half. The drop-out and wastage rate is high in those countries and the years of schooling too few, which reduces the value of the education received by the children who are enrolled. These facts illustrate the size of the educational task facing the developing countries over the years ahead.

Some characteristics of education in economic analysis

Some special characteristics of education which affect its economic analysis are:

1. The direct economic impact of education is upon the quantity and quality of occupational skills, labour usually accounting for some three quarters of national output, and education being a major source of the productivity of labour. Education also has a direct impact on the economy through increasing the stock of knowledge and ensuring its diffusion.
2. It can also have many indirect effects. It may raise the level of initiative and inventiveness of the population; it may improve consumption

patterns, and may promote economic and social mobility. The educational system can serve also as an instrument of selection by which a society finds its leaders, entrepreneurs, administrators and technicians and improves their quality.

3. The demand for education may be divided for the purposes of analysis into two parts: one for production purposes, and the other for consumption. We use our education to earn a living, and we use it to enjoy the fruits of living. It is not easy to make this distinction in practice and we have also to note that both the individual and society use education as a means of preserving and developing their value systems—a function which does not fall under either production or consumption in the economic sense. When Professor Schultz made his calculations of the financial returns on education in the United States he assumed that 50 per cent of education was consumption and halved the cost to take this into account.[1] In developing countries the consumption portion should theoretically be smaller because the over-all amount of education available is less and economic needs are greater.
4. The role of education as an item of consumption, and the fact that it is treated as a social item in national accounting has obscured the part it plays as an economic investment. Some economists have attempted to distinguish between investment in technical education as productive and expenditure on general education as consumption. This overlooks the fact that general education is a necessary prelude to technical education, and underestimates the role of the educational system as economic infrastructure. Trade is important as well as production, and grades such as clerks and accountants as well as engineers are needed for economic development. It would seem that the whole of that part of national expenditure on education which results in the raising of income can be regarded as an economic as well as a social investment.
5. Education requires a relatively long-term span for its returns to accrue, but it has a lower rate of obsolescence than most physical capital. For planning purposes a time span of ten to twenty years has to be envisaged for the educational system as a whole. Quicker results can of course also be achieved by influencing the students already in the 'pipelines'. Examples are special training facilities to young people already in the educational system; temporary adjustments of curricula and teaching methods; programmes of re-schooling by re-capturing people who have already passed out of the educational

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[1] T. W. Schultz, 'Education and Economic Growth', *Sixtieth Yearbook of the National Society for the Study of Education*, Part II, 1961, p. 75, Chicago, Ill., University of Chicago Press.

system. These can be effective provided the attraction of such short-term yields does not result in neglect of the basic long-term functioning of the education system since quality as well as quantity has to be watched at all times. Choices have to be made between investments in the various educational levels based on long-term criteria in respect of both quantity and quality.

6. The educational system is interlocked functionally with the socio-economic environment. The expansion of education is linked to the employment situation, since people expect to earn a living commensurate with their educational attainments. And, being large consumers of budgetary resources, educational systems are dependent upon the national administrative and fiscal systems within which they operate. They cannot be considered as self-contained systems for planning purposes. Only by integrating educational planning with over-all planning can it be hoped to avoid the problems of 'the educational unemployed' on the one hand and the shortages of trained cadres on the other. The preferences of parents and pupils in the end govern entry into the different available types of education, however good the educational guidance programme may be, and it is right that educational plans should allow for the element of human choice as to the best use of one's talents. But it is necessary to provide incentives and ladders to lead pupils into priority occupations for the attainment of the development plan.
7. The educational system is a large consumer of its own product. In the United Kingdom, for instance, in 1970 the educational system will employ more people than any single industry or service or than the Armed Forces. In particular, educational systems make a heavy demand on the supply of people with secondary and higher education. In some developing countries the largest single category of high-level manpower is qualified teachers.

Social factors in educational planning

In the chapter by Professor Sauvy which follows later in this volume, there is a full discussion of social aspects of education, and for the purpose of this chapter, which is introductory, the main social aspects of the planning of education can be listed under the following questions: (a) To what extent should education be treated as a thing in itself, i.e. a process of personality formation based on the primacy of the individual; or be an instrument, i.e. a socializer of individuals and a transmitter of particular cultures and values? (b) Given education to be an instrument—how can it best be used as a means of social restructuring and 'social engineering'? (c) Given education as an instrument—to what extent is it, and should it, be primarily training for occupation, and to what extent primarily a training for national citizenship? (d) What is the effect of different types of educational structure and teaching on: (i) social stratification and social mobility; (ii) élite formation and entrepreneurship; (iii) attitudes, motives and incentives to social change, technological progress, invention, innovation and imitation? (e) What, in turn, is the effect of these factors on the educational system? (f) What is the influence of the school and teacher on the local community, and vice versa, in development terms? (g) What is the role of the universities in national development?

The sociology of education also includes a number of specific topics, such as 'the nature of the communication process in learning', 'the nature of the pupil-teacher relationship in different types of community', 'the teaching of prejudice', 'socio-psychological and class aspects of intelligence tests and examination systems', etc. Themes of this type, however, affect educational administration and practice rather than planning and should be excluded for our purpose. Similarly the question (a) above can be excluded since it is in the field of educational policy rather than planning, though it enters into the 'social minimum' concept discussed under the two headings which follow in this chapter.

As regards the question under (b), recent research indicates that education is at present not a very effective means of social re-structuring, although there are individual successes to record in particular cultures and situations.[1] Educational systems usually reflect social structure rather than change it, and educational policy and planning designed to encourage social mobility seem to have much less effect than hoped—at least over a certain threshold of economic development owing to the influence of the family and the socio-economic environment in which pupils spend their childhood. In the developing countries the effect of education on mobility seems more positive. In these countries, there is less education and less educational opportunity and large income differentials between more educated and less educated people and the growth of the educational system and the bridging of income differentials tend to move together. Education can thus play an important role in these countries in the formation of a middle class and an informed electorate basic to democratic society.

As regards the question under (c), the evidence is that few countries hitherto have placed, at any rate in their policy decisions, emphasis upon the role of education in manpower or human resource formation in the economic or occupational sense. Education has predominantly been regarded as training for life rather than livelihood. The tendency has been to concentrate upon the educational needs of the child in a

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[1] A. H. Halsey, J. Floud and C. A. Anderson (eds.), *Education, Economy and Society*. New York, Free Press of Glencoe, 1961.

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personality context or as a future 'citizen', rather than upon his future contribution to economic and social development, broadly conceived. This is scarcely satisfactory in stagnant or poorly developing economies whose future depends on breaking out of a vicious circle of poverty and a social system which does not lend itself to development. The emphasis to be placed upon education for occupation or education for citizens varies with the stage of development of the society. There is no doubt that a sense of national citizenship, to which the school system can contribute, is a major asset in development. However, there is no substitute for the task of human resource formation in occupational terms if modern development is to be achieved.

As regards (d) above, we have already seen that social stratification and mobility may be affected by the shape of the educational pyramid, and the system of entry into the higher levels of education; but that the effectiveness of educational measures will greatly depend on the situation outside the educational field. Nonetheless, the introduction of scholarship ladders and other measures to exploit social mobility as much as possible as a development asset is clearly necessary. As regards questions (e), (f) and (g), these issues turn round the degree of independence exercized by the educational authorities in the national administration and by the school in the community. Pressures upon the educational system to reflect social and political influences rather than purely pedagogic ones vary according to the prevailing political tradition and forms of administrative organization. Even between countries of similar political traditions, substantial differences exist in this respect. These too are perhaps primarily matters of administration rather than planning in the sense used in this volume.

Areas of choice: some policy problems

The economic analysis of education centres round the following main questions: how to relate educational systems to over-all development needs (economic and social); what is the level of investment to be made in education; what is the optimum relation between the different levels and sectors of the educational system (the education 'mix'); how the productivity of educational systems can be improved; how can education best be financed; and what are the returns on investment in education.

In strict logic the last question should be taken first, since the level of investment should depend on the returns to be obtained. Much work is being done on the problem of measuring the returns on education and the last section of this paper gives a brief review of what has been accomplished but there are as yet no established procedures which the economic planners can utilize. We have therefore chosen to begin with a pragmatic approach and to discuss how the required level of investment can be derived from the development perspective or plan. To the extent that education is an irreplaceable and integral part of the development plan, little practical purpose is served by assessing its returns, and they are in any event difficult to isolate from those of the development plan itself.

Economic analysis, in order to be applied to a given activity requires that there should be real possibilities of alternative use of resources in the activity under examination. What are the degrees of choice and possibilities of substitution in educational planning? The educational system itself is of course not substitutable. Every society must have an educational system. No civilized society is known today to spend less than about 1 per cent of its gross national product (GNP) on education and none more than about 6 per cent. Between these two percentages huge resources are involved and important possibilities of resources substitution arise, not only as regards the size of the educational effort as compared with other economic and social programmes—education as an infrastructure service competes with public transport and housing and with such social services as health and welfare—but inside the educational system itself.

As regards its impact on the creation of skilled manpower a *prima facie* area of substitution is between the amount of specialized training to be given in the formal education system and the amount to be undertaken on the job in trade, industry and the services. In the United States of America a sample survey by the United States Department of Labor has revealed that the average period of workers' formal schooling was 10.1 years in 1950 while the average period spent on in-service training was 1.72 years at that time.[1] These proportions had changed slightly since 1940 and there is no reason to suppose they could not vary further. There are, however, serious limitations as to the extent of substitution possible without loss of efficiency. This is demonstrated by the research of Professor Strumilin,[2] who contributes a chapter of this volume, which indicates the large superiority in productivity of workers who had adequate formal schooling plus vocational training in industry, as compared with those who had only training on the job. The results of his study are shown in Table 1, overleaf.

It is clear that efficiency rose much faster in the case of those who had formal schooling behind them. Once a man has received his formal education and his on-the-job training, there is no substitute for the

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[1] *Estimates of Worker Training Requirements for 4,000 Jobs*, United States Department of Labor, Bureau of Employment Security, United States Employment Service.

[2] S. G. Strumilin, *Economic Importance of Education*, Moscow/Leningrad, 1924. 'Vie Economique' series.

Table 1 *Cumulative rise in efficiency (in work units) per year*

Year	Training on the job without schooling	Schooling and training
First	0.16	0.30
Second	0.15	0.23
Third	0.14	0.15
Fourth	0.13	0.11
Fifth	0.11	0.08
Sixth	0.08	0.04

experience he acquires on his work.

Inside the education system itself there are important areas of possible substitution in respect of the different types of educational structure, the content of education and teaching techniques. These items cover the ratios of enrolment of the school-age population in the different educational levels and sectors, and the extent to which the education is general or technical.

Problems of the productivity of the educational system are always present, e.g. the possibility of the use of educational facilities on a shift basis, the use of radio and television as compared with direct teaching, and the study of the alternative unit costs of different types of education. The size of educational expenditure is affected not only by the cost of its inputs but by its efficiency, and a reduction of unit cost is equivalent to an increase of financial resources allocated. Many educational systems use their resources below capacity, partly due to the socio-economic environment and to traditional attitudes which consider that education falls outside of economic allocation approaches, and partly from failure to adopt adequate criteria of selection and attainment. In one country, out of 100,000 who sat for the matriculation examination in 1959 only 3 per cent passed, and only 30 per cent of students at the university passed their annual examinations.[1] In many developing countries half of the pupils abandon school in the first three years, mainly for socio-economic reasons.

Areas of choice also exist as to the sources to be tapped for financing education (the extent to which the sources should be central, local, governmental or private, voluntary or compulsory); though in many cases the political and administrative framework will closely limit this choice. Further, there is the choice facing the over-all economic planner as to the industrial technology to be introduced to carry out the development plan;

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[1] Hla Myint, 'The Role of Institutions of Higher Education in the Development of the Countries in South-East Asia', Unesco/International Association of Universities Committee of Experts, Kuala Lumpur, 23-27 Feb. 1962.

whether this should be labour-intensive or capital-intensive, and whether (of particular interest to the educational planner) it should be 'education-intensive' or otherwise. Then there is the choice as to how much of its own product the educational system should utilize for its own maintenance and expansion, and how much of its output should be put into the expansion of national production, without which the growth of the educational system cannot be financed. In coming to decisions on such choices, clearly the planner must know the potentiality of the educational system of his country and the cost of remodelling it, since this will affect the cost-benefit ratios of the different alternatives.

Finally, there are major areas of choice as regards the place of education in social programming. These choices concern the over-all aims of education, the distribution of the educational effect by levels and by regions, as well as the timing of educational investment in relation to other social objectives. Examples are:

1. Should a country make universal literacy and a long educational cycle a *sine qua non* of its development programme, even if the effort to do this would reduce the over-all level of living and delay over-all development? Or should it concentrate first on quick measures to raise national income in order to provide for universal literacy and longer education at a later period when it can be established with less sacrifice?
2. Should a low-income country—as part of a policy of seeking a quick economic break-through—give preference to its economically active areas, rather than try to spread the educational effect evenly over the population? Or, alternatively, should it make a special educational effort in lagging regions?
3. What amount of education and what structure should be regarded as a social minimum independently of the occupational demands of the development plan? e.g. should every country spend, for social reasons, at least x per cent of its GNP on education; should every country have at least two universities?
4. After the social minimum and the economically determined educational target have been attained should the State move out of educational expenditure? Should the State argue that its obligation is limited to the development plan, and that school expenditure not required for this should be put on the private consumer? Would it be feasible to divide an educational budget in this way and to administer the educational system accordingly? It seems unlikely that it would be possible to divide up the educational system accordingly, since, as we saw above, the economic and the consumption aspects of education are interlocked.

Different political philosophies and practices exist on these issues, and development planners have to work at different times and places on different hypotheses. For this reason the educational planner has frequently to offer more than one alternative course with the different costs attached.

Most of the other areas of choice of a social nature relate to the implementation of educational plans rather than to questions of its part in over-all national investment. Many educational systems contain in their curricula, teaching methods, and school structure, elements designed to preserve traditional attitudes rather than favour their adaptation to modern conditions. Choices have to be made as to how far the content and distribution of education should serve the purpose of social conservation or social change. Many of the developing countries face major problems of social change caused by the movement of large numbers of people from the countryside to the town, the transition from subsistence to cash economies, and the impact of industrialization and technological change. In respect of these problems, countries have the choice of making rapid social adjustments, in which education can help, or of risking serious dangers of social disintegration.

Five approaches to integrating educational planning with development planning—thirteen points of analysis

No planning and programming, since it involves evaluating the effects of alternative types of action, can be effective unless the aims to be achieved are clear. Unfortunately, educational objectives are not always as well defined as some of the other objectives of development policy, and governments, educators, and civic leaders need in many countries to make a more precise formulation of educational aims. Before planning as a technical operation starts, the socio-economic and cultural goals should be set in a normative sense.

The word 'planning' has lost the undertones it had earlier of infringement with individual liberties and is becoming increasingly accepted by all as part of the vocabulary of development, each country having its own type of planning within its own political system. In what follows, planning refers to the system a country adopts of forecasting its needs and setting up a framework, or alternative frameworks, of national action to meet them. It deals with matters which are subject to forecast and to substitution and can never cover the whole policy. A sudden policy decision to devaluate the currency or to enter a common market may have more important effects on economic development and social structure than the most detailed ten-year plan.

The main approaches and techniques of relating educational planning to development planning, which are in use or recommended by various authorities are set out below. Usually combinations of methods are in operation:

The first approach, which may be called the *social method* is that in general use, but is scarcely a method at all, and is a starting point from which improvements must be devised. This method takes educational needs in terms of the current demand for education at the different levels and projects them on the basis of population increase, age distribution, long-term national or social goals (inarticulate or defined) and on the basis of what is known about State and consumer preferences for education. Among such goals and preferences are universal literacy, universal compulsory primary education, and cultural objectives. The stress is upon education as social infra-structure for development purposes, and as an end in itself. The financial implications of these targets are then considered. The usual result is that the funds required for the educational expansion are found to be larger than those available either to launch or to sustain it, on the basis of projections of national income and revenue. A compromise is struck, and what is deemed to be a feasible plan emerges, cut down to the funds expected to be available. This is the traditional approach, and may work satisfactorily in high-income countries, although even in these, concern over flagging rates of growth and ever-increasing competition in export markets is leading to increased emphasis on the contribution of education to technological progress and productive efficiency.

The second approach, which we may call the *manpower approach,* is based on the fact that, as we saw earlier, the main link of education with economic development is through the knowledge and skills it produces in the labour force. To the extent that the educational system produces qualified people in the right numbers and places, the major part of the economic and social contribution of educational planning is achieved, provided that in so doing the educational system has not consumed so great a proportion of resources as to set back the development plan itself. Various methods exist of estimating future manpower requirements and the demand they will make on the education system. These are examined in detail in Professor Harbison's chapter in this volume. But various difficulties hamper this approach as Professor Harbison recognizes. First, manpower forecasts can seldom be made with reliability beyond short-term periods of five to eight years. The time perspective required by educational planning as a whole is fifteen to twenty years, though it is possible to influence over shorter periods the supply in the 'pipe-line'. Secondly, the educational component of different occupations changes with technological progress and the rise of educational standards.

A further limitation on the manpower approach is that it leaves out of account provision for education as a 'consumers' good', and it makes no provision for the 'social minimum'. It is tempting to believe that these objectives might be obtained as by-products of the training for occupation by influencing curricula, but this is unlikely. The occupational needs of the economy are not the whole of society's needs for education. An addition has to be made for women and girls who are not gainfully employed, and for the amount of education which a country requires to fulfil its cultural, political, and social goals. It is also necessary to assure that educational output will grow faster than demand to the degree required to stimulate growth, without creating problems of unemployment. The educational plan must also provide for turnover of employment and continuous adjustment between the educational system and the socio-economic environment. Full account must be taken of the 'wastage' involved in various educational systems, as well as students switching in mid-stream, students' and parents' preferences, locational disequilibrium of supply and demand, and adjustments required by technological change.

Finally, there is the problem that the composition (or 'product mix') of the development plan leading to the occupational demand must not be determined irrespective of the educational requirements it imposes. The composition of the target 'product mix', and of the investment programme undertaken to achieve it, must depend in part on the relative cost of the various types of educational programmes needed. In short, investment in education and in all other sectors of the development programmes should be mutually determined.

Professor Arthur Lewis, in his article 'Education and Economic Development'[1] dealing with what he calls 'investment education', and having particularly in mind African countries, states: 'One can calculate the percentage of the age cohort who should receive secondary education from the formula:

$$x = n\,\frac{(a + b + c)}{m}$$

where:

x = proportion of age cohort to be recruited;
n = ratio of number of secondary-type jobs to adult population;
m = ratio of number in age cohort to adult population;
a = normal percentage wastage of nationals of the country;
b = abnormal wastage due to replacement of expatriates;
c = percentage of rate of growth of the number of secondary-type jobs.

'Of these c is the most difficult factor to assess.'

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[1] Arthur Lewis, 'Education and Economic Development', *Unesco/ECA Conference of African States on the Development of Education in Africa, Addis Ababa, 15-25 May 1961. Final Report*, Paris, 1961, pp. 71-9.

If this formula is to be used to estimate total requirements, and to be used widely, we have to add the secondary school places needed to maintain the flow to higher education, since this flow has to pass through the secondary level. We have also to make provision for education of women and girls and others who do not work. A further comment on Professor Lewis' formula is that it does not take account of the fact that as national income rises the proportion of the labour force to the total population normally becomes less. This is caused by the raising of the age of entry into the labour force, by the lowering of the age of retirement, and by the reduction of the number of workers marginal to the labour force (e.g. married women). Thus quantitative estimates of educational requirements based solely on labour force demand ten to fifteen years ahead would underestimate a country's over-all educational needs.

Since the contribution of education to occupational needs is the predominant part of its economic value the manpower approach is clearly an indispensable link in the chain. Particularly valuable studies to relate education to manpower needs have been made in France, Italy and India. A study by SVIMEZ[1] sought to relate needs of the Italian economy, growing at an assumed rate of 4½ per cent per annum, to the educational system. It foresaw extension of education up to fifteen years and a large increase of intermediate education (15 to 19) to respond to the technological changes foreseen in the economy, which were assumed to be very great (see Tables 2 and 3).

Table 2 *Educational level of the labour force (millions)*

Level	1959	1975
Elementary education	9.5	4.4
Lower secondary	1.6	11.0
High secondary	1.2	4.5
University graduates	0.5	1.0

The third method is based on the capital-output ratio approach and might be called the *education-output ratio method.* It relates the stock of educated people and the flow of children and students completing education at the different levels directly to the national output of goods and services without passing through the intervening stage of making manpower forecasts. A series of linear equations are set up relating the stock of persons who have completed a given level of education, and the

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[1] SVIMEZ, *Trained Manpower Requirements for the Economic Development of Italy. Targets for 1975*, G. Martinoli, chairman of Committee of Experts, Rome, Giuffre, 1960, 91 pp.

Table 3 *Years of education of the labour force*

Years of education	Percentage of labour force	
	1959	1975
5	85	—
8	10	25
10	—	48
13	3	16
16	—	6
19	2	5

number of students at each level, to the aggregate volume of production. These equations will show how the structure of the educational system should change with different growth rates of the economy. This method is developed in the chapter prepared by Professor Tinbergen. Every method has its difficulties and limitations. The problem here is that assumptions have to be made about teacher-student ratios and about the adequacy of the relations of the education 'mix' to the product 'mix' at the base from which the projection is made. If these assumptions are incorrectly made they will invalidate the conclusions. Further, the differences of rates of growth in the different economic sectors, and increases of productivity, need to be included. The range of assumptions as to the technical coefficients is very wide. None the less this method, used with good informed judgement, is a useful exercise to be set alongside the other approaches.

A further difficulty common to both the manpower and the education-output ratio approaches is the assumption that a given output requires a fixed volume of manpower with fixed amounts of education and training. The fact is, however, that a certain latitude exists for substitution of capital for manpower in general, and for substituting additional education and training for man-hours. A given output may be produced with a small number of highly trained workers or a large number of less trained workers. It may even be possible, through automation, to produce it with a smaller number of less highly trained workers. In short, just as the choice of technology, and its implications for education, is an important aspect of development programming, so is the choice between more education and training and less employment, or less education and training and more employment in each sector. The broader the categories of output, and the broader the definition of educational inputs, the less fixed are the relations between them and the wider the area of choice. In many developing countries the shortage of data, of mathematical statisticians, and of computing facilities, would not permit computation and projection of relationships among large numbers of output categories and large numbers of education projects. In such cases, the choice of parameters to be used for projection—a choice which is a policy decision and not a matter of statistical analysis alone—is more important than the projection as such. The model provided by Professor Tinbergen, however, breaks new ground in setting out a comprehensive system of variables and relationships which provide a conceptual basis for a quantitative estimation for the planning of the educational system.

The fourth is the *aggregate method.* This method tries to relate educational needs to the whole demand of society for education rather than to the level of output or to manpower, and is based on norms and patterns which emerge from an empirical study of the educational situation in countries at different stages of development. Among them are (a) the proportion of GNP devoted to education globally and (if possible) by sector; (b) the proportion of public expenditure devoted to education and its different sectors; (c) the proportion of over-all investment devoted to education; (d) the proportion of the population enrolled at the different educational levels; (e) the above information corrected by estimates of wastage; (f) the proportions of the school-age and student population enrolled at different levels.

Patterns of educational development in relation to over-all development can be seen by setting these coefficients against indices of economic growth and social attainment. Social indices can be used with the help of ranking techniques. Use can also be made of data on what appear to be irreversible trends, e.g. the movement from primary to secondary and tertiary occupations, and estimates of the relative rates of growth of more highly qualified manpower in relation to the total growth of the labour force. A number of problems arise in respect of the interpretation of the coefficients listed. For example, the proportion of GNP spent on education will vary with the age composition of the population and not reflect an equality of effort. Another variant strongly influencing the comparison is the ratio of *per capita* teachers' salaries to *per capita* income, as the country differences are wide and the greatest proportion of educational cost is made up of teachers' remuneration. A full study of this approach is contained in Professor Harbison's chapter in this volume.

Fifth, there is what we may call the *human resources assessment* approach which is a comprehensive one, developed by Professor Harbison in Chapter VI. It starts from the position that education is one of the main sources of human resource formation, other sources being measures in the fields of manpower, employment, training and health. The strategy of human resource development consists of integrating these factors with general economic and social development planning. It takes into consideration such factors as the scale of development feasible considering the availability of specialized manpower, the scale of development needed to absorb the backlog of unemployed and the new entrants to the labour force, the extent of in-service training in industry, the pattern of investment priorities envisaged in the plan and the broad economic, social and educational goals of development planning.

From these five approaches we can derive a list of principal points to be taken into account in attempts to undertake a comprehensive planning of education in relation to development. Thirteen such points are set out below. Ten of them involve the relation of education to the economic and social environment, namely, points 1, 2, 3, 4, 5, 6, 7, 11, 12 and 13. Three of them are concerned with factors internal to the educational system, namely points 8, 9 and 10. Most of them are for long-term planning but points 8, 9, and 10 also relate to the short term.

1. Projections have to be made of the future size and demographic composition of the population for a period of fifteen to twenty years. If possible the school and university age groups should be shown on a year by year basis. The census returns do not normally separate out the school age groupings. But many census reports tabulate the population up to 24 years of age by five-yearly age groups and demographic techniques exist to re-distribute the number within the five-year age period into estimated numbers for single years of age, which are described in the United Nations *Methods for Population Projections by Sex and Age*.[1] The projections will show the number coming forward year by year in the different age groups in respect of whom educational planning decisions have to be made. The existing stock of educated people at the different levels should also be ascertained.

2. On the basis of the data thus obtained, a social standard or social minimum of education may be postulated. This may be taken as compulsory schooling for every child for a certain period of years; or it may be universal literacy for adults as well as children. The minimum objective, whatever it may be, will need to have a target date set for its achievement. The length of the period will depend on the resources found to be available and the degree of sacrifice of other objectives which may be involved. This can be ascertained only after the other steps of the assessment have been made including the positive contribution of the social standard to the development plan itself as well as its cost. At this stage the social standard can only be postulated, and then re-estimated after 'feed-back' when the other points of the assessment process have been completed.

3. The next requirement is to study the long-term plan, or the best possible long-term projections, of the economy by sectors and sub-sectors. A period of fifteen to twenty years should be envisaged. Failing detailed projections some future profile of the economy will have to be assumed.

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[1] Published by the United Nations, New York, 1956.

4. The levels of economic activity assumed have now to be analysed to establish the manpower requirements which flow from them. This can be done by using norms obtained from census returns and sample surveys showing the numbers and skills of the labour force required for different types of production. The norms should be based on industrially accepted and not on hypothetical occupational structures, and should then be adjusted for foreseeable changes brought about through the advance of technology affecting the nature of industrial skills, as well as for such factors as trends in wages and hours of work affecting the demand for labour.

5. The occupational data so obtained needs to be translated into its educational component. The number of classified occupations in the International Standard Classification of Occupations prepared by the International Labour Organisation (ILO) is 1,345, and the classification of skills by educational components can produce 300 items in advanced economies. Difficulties are that there are no fixed relations between occupations and education, except over broad categories and in a certain number of professions. For planning in advance up to ten to fifteen years it is not necessary to disaggregate into as many as 300 items. The educational facilities, enrolment flows and cost structures have at this stage to be grouped as broadly as possible. As progression takes place into the planning period it is possible to come closer to the more detailed specifications required, and plan for training of more specialized categories within the facilities provided under the long-term plan. Education is the core around which specialized training has to be built and thus should not be planned in too great detail as regards specialization within occupations in order that the educational system should be as flexible as possible. For perspective planning purposes the educational classifications of occupations can probably be reduced to ten to fifteen. Even smaller groupings are possible, according to the time period and detail the other factors in the planning process permit. Recourse has to be made to census returns, sample inquiries, and consultations with employers and trade unions, as well as with educational planners, administrators and technicians concerned with the different types of education involved. Once again too, estimates should be based on the best practice rather than on theoretical educational needs for different types of work, except to the extent that changes in practice can be foreseen and incorporated into the analysis. An analysis of the problems to be faced and techniques to be used in points 4 and 5 is given in the chapters by Professor Harbison and Dr. Skorov later in this volume.

6. The foregoing analysis will have shown the social standard or social minimum demand plus the derived occupational demand for education

over the planning period. It is now necessary to add the additional demand for education to cover:

(a) Provision for switches made by students in midstream, and other forms of 'turnover' and for geographical disparities of supply and immobilities of demand. (Just as there has to be at any given moment a certain amount of frictional unemployment, even in conditions of full employment, so there should always be an educational surplus to the extent necessary to provide for environmental adjustments.)

(b) Education in excess of demand to the extent that education is a field in which the existence of supply creates demand. Professor Arthur Lewis[1] has stated that educational output should always move somewhat in advance of demand since economic growth inevitably requires a progressive raising of skills. It is clear that the existence of qualified manpower attracts investment, but planning for education to move in advance of demand needs great care because of the danger of creating groups of educated unemployed who cannot be absorbed by the turnover of the economic system and its rate of growth.

(c) Additional facilities for formal education required to meet other national objectives and consumption patterns not already taken into account.

(d) Adult education and literacy campaigns.

7. The quantitative changes required at the different educational levels to meet the estimated demand have now to be assessed. This involves translating the total educational demand into the outputs required from the different levels of the educational system. These outputs will have emerged from the analysis already made at points 5 and 6. At point 5, it will be recalled, the balance between the different development sectors (the 'product mix') was interpreted into the 'educational mix' (i.e. the balance between the different lengths of schooling and types of education required to create the supply of occupations needed for the development plan). At point 6 the projected structure of the educational system and its output at different levels and types of education was adjusted further to cover 'turnover' and demand going beyond occupational needs. These outputs have then to be provided for by enrolment inputs, taking into account anticipated rates of wastage and drop-out,

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[1] Arthur Lewis, 'The Strategy of Educational Development in Relation to the Economic Growth of Underdeveloped Countries', *OECD Policy Conference on Economic Growth and Investment in Education, Washington, 16-20 October 1961*, Vol. III, p. 38: 'One ought to produce more educated people than can be absorbed at current prices, because the alteration in current prices which this forces is a necessary part of the process of economic development.'

and rates of movement between educational levels. A time period has then to be allotted to securing the necessary expansion of the educational system. This period depends upon the logistics of the educational process, e.g. time periods required to train teachers, to build schools, and for the pupils to move through the various levels. Out of this analysis there should emerge one or more projected pyramids of educational expansion with time schedules attached to them.

8. While these pyramids will constitute the broad basis for the over-all planning of education in terms of numbers of pupils at the different levels, and so indicate the number of primary, secondary and university places needed, a detailed assessment is needed of subjects of study within levels and qualitative changes required. While for building estimates, or for estimates of teacher training needs, many subjects of study may be assimilated, others will require special physical equipment and varied training periods. These requirements will be derived from the proportion of places to be provided in the different subjects (humanities, engineering, etc.) and whether general formal education is required over the whole country or whether in rural areas a different type of education should be given which would be of a more practical nature and choices will have to be made on questions such as concentration on practical or less practical studies, emphasis given to technical ability as compared with paper work, etc., which will greatly influence educational output. The assumptions on these issues will affect the subsequent cost estimate, since the schools and their equipment would be different and the teaching methods (direct or mechanical) would vary, particularly when adult education is the priority.

9. Other qualitative aspects to be assessed at this stage (some of which, e.g. scholarship ladders, will affect cost) are: the degree of efficiency to be expected from the educational system in the pedagogic and social environment; whether the content of curricula and selection criteria for the different educational levels are effective; whether the educational system is so organized as to exploit to their maximum the more indirect economic and social gains from investment in education. Thus an educational system with adequate scholarship ladders will tend to promote social mobility and the selection of talent. Similarly, if there is a close relationship between the educational system and the business and administrative world and with research, the contribution of education to entrepreneurship and innovation will be enhanced.

10. The comparative cost and efficiency of alternative technologies of teaching and teacher-training methods to produce the same output has then to be studied. The technology of teaching chosen and the number of

teachers per class will influence the amount of teacher training required and the amount of mechanical equipment needed. The unit costs of different types of educational facilities will need to be assessed. The total changes required in the educational system, both quantitative and qualitative, which have emerged have then to be created. The chapter by Mr. Solomon in this volume contains guidance on the costing of educational plans.

11. These costs have now to be studied in terms of the availability of future resources, and their competition with other expenditure required for the development plan. For this purpose a division of expenditure is required into those items which involve the use of scarce resources which could be used for other development purposes, and those items which do not involve real costs. Examples of the former would be school buildings competing for resources with factory or road building, and teachers who would otherwise be engaged in other productive employment. Examples of the latter would be salaries paid to teachers who would otherwise be unemployed and schools built out of unused resources of labour and materials.

12. At this point arises the most difficult problem of all. It involves the reconciliation of the education programme with the over-all development programme. This reconciliation requires that: (a) the education programme is not so high in real cost as to be inconsistent with the achievement of other targets in the development programme; (b) the physical capacity of the 'education industry' is such that all the education requirements of the final over-all development programme can be met. If either of these conditions is not fulfilled, adjustments must be made until the reconciliation is achieved. These adjustments may take the form of (a) reducing the education budget, up to the point where only the basic needs can be met; (b) reducing the budgets for other sectors in the development programme; (c) choosing a less education-intensive technology; (d) choosing a less education-intensive product mix; or (e) choosing a lower rate of economic growth.

The process of reconciliation may involve successive approximations. Several of these adjustments may be made in sequence, until the point is reached where all educational requirements of the development programme are met, while at the same time the aggregate demand for monetary and physical resources from the education sector and all other sectors does not exceed the available supply. It is also necessary that the monetary cost of the educational programme, when added to that of the other sectors, does not increase the tax burden so much as to retard economic growth, or cause detrimental inflation through excessive deficit finance.

13. Given an adequate pattern of development on the supply side, the next stage is to study the incentives or other measures required to guide pupils into those particular studies, and school leavers into these occupations, including questions of the wage structure and prestige of the different occupations. Students' and parents' preferences have to be foreseen and guided. The existence of a long-term plan may be in itself an important incentive indicating that a degree of assurance can be attached to employment in particular occupations. The actual and possible flows between the different levels and sectors have also to be studied having regard to pedagogical standards and selection criteria at present in operation or desired.

Most of the thirteen points listed can be studied on the basis of established techniques of analysis and forecasting. Those which present special difficulties are: the postulation of the social minimum in point 3, the estimation of the demands set out in points 5 and 6, and the final conclusions to be reached in point 12. The problems involved in point 12 are those of development planning as a whole and flow from the over-all economic development policy chosen. The educational response to a policy of 'the Big Push' would be different from that to a policy of 'poles of development'.

The concept of the social minimum or social standard introduced as the second analytic point needs careful study. For the purposes of economic analysis we treat this as a possible plus or minus factor in terms of contribution to growth of national product. It is postulated after the demographic data has been obtained, but not determined until the other points of analysis are completed and the extent of positive or negative influence on output assessed. The notion of the social standard arises from policy decisions of governments which are regarded as fundamental to the political and social life of the country, e.g. that universal literacy must be established as a first priority, or that a school must be established forthwith in every village of more than so many inhabitants. Decisions of this kind are similar to those taken by governments when they rule that the defence effective should not fall below so many divisions, or decide to set up a national steel mill even though steel could be imported more cheaply and the 'external economies' of the mill do not compensate the price differential.

It can be argued that it is logically invalid to try to separate out a social standard in any part of the planning process—since the purpose of a plan is to fulfil stated objectives, whether they maximize output or not—and that it is best to include it as a 'utility' preference. Such an approach, however, greatly complicates analysis, and even renders it impossible, because it introduces factors which cannot be assessed quantitatively (or qualitatively by objective criteria).

For this reason we put forward the approach of postulating a social standard of educational expenditure, examining the implications for output, and showing it as a plus or minus factor to the extent that it contributes to or inhibits the optimum utilization of resources to raise national product. This does not, of course, mean that when governments make their final decisions they should fail to select items which may be negative rather than positive in terms of maximizing output. It simply means that they must know the amount of the cost they are incurring in national product in order to achieve political and social aims.

The planning of education in relation to development requires data and procedures and forms of interdepartmental consultations which do not exist in many countries. High-level social and political decisions are required as to goals, and high-level economic decisions as to development policy. The establishment of a planning machinery, if it does not exist, is required, and detailed work by different sections and departments of governments and persons trained in different disciplines. Once the planning is established it has to be kept periodically under review so that it can be adjusted to changing needs.

The organization of educational planning is discussed in detail in Mr. Diez-Hochleitner's chapter below and an account of the position in different countries can be found in a joint publication of the International Bureau of Education and Unesco.[1] The relation of the central planning machinery to educational planning is dealt with in the section on allocation which follows in the present chapter. A discussion of the planning of the educational system as part of the strategy of human resource development in the over-all development planning process and the requirements for a machinery of planning is contained in Professor Harbison's chapter which follows.

Other indicators for deciding levels of investment in education

When detailed analysis as above is not practicable as is often the case in developing countries we have to fall back on simple methods and in this respect the aggregate method described above is helpful. In such cases it is necessary to use norms and analogies, and to derive conclusions about the future from what is known regarding present macro-economic and macro-educational relationships in the country concerned and in other similar countries. Patterns of educational organizations appropriate to different levels of development emerge from inter-country comparison. Norms which can usefully be studied were listed on page 31.

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1. *Educational Planning*, Publication No. 242, 1962.

Naturally this information has to be interpreted in the light of the special conditions of each country and should always be cross-checked with the results of manpower assessments, and the educational requirements deduced from the economic perspective. Further such indices should be checked one against the other and not used in isolation. Recently the Opposition leader in a developed country cited estimates of total university students as a proportion of the total population in various countries to show how far the nation was lagging behind other countries. The Government in reply cited percentages of the relevant age group graduating from universities to show how the nation was doing better than many of the same countries cited by the Opposition. Patterns of educational development are visible from the statistical data set out in *Basic Facts and Figures* prepared by the Statistics Division of the Social Sciences Department of Unesco. Economic indices against which to set these patterns which emerge are the statistics of growth of GNP per head (or of *per capita* income) corrected as far as possible by indices of income distribution. Social indices such as the following can also be utilized: percentage birth rate; percentage death rate; percentage of labour force in agriculture; percentage urban population; percentage intermediate and senior grades of employment in secondary sectors; percentage labour force in primary sectors; percentage employed in industry; calorie intake; doctors per 100,000 inhabitants; number of inhabitants per hospital bed; percentage illiteracy; primary school enrolment; percentage secondary school enrolment; university enrolment per 10,000 inhabitants; newsprint consumption; newspaper circulation as percentage of population; percentage of radio sets in the population.

Recourse can also be made to norms of structural change in the educational system. These must be based on what is known as to rates of educational expansion which have been attained, e.g. the number of years it takes to produce different levels of attainment, including not only pedagogic and demographic factors but also teacher training. It is known, for instance, that certain of the advanced countries, France, U.S.A., U.S.S.R. have increased their over-all teaching force by 50 per cent in ten years. On the demand side there are similar norms as to rate of expansion known from experience, which can be applied, corrected for the state of development of different countries. Professor Harbison[1] has estimated that the ratio of annual increase of higher level manpower to the annual increase of national income should usually be of the order of three to one: that scientific and engineering grades should grow numerically three times as fast as the labour force, that the subprofessional grades requiring secondary education should grow six to nine times as fast, and clerical grades and craftsmen twice as fast. Obviously this cannot be true for every type of economy and every sector, and in practice the rate will depend upon the stage of development and structure of the economy at the base year; but these are valuable guide lines.

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[1] F. H. Harbison, 'The Strategy of Human Resource Development in Modernizing Economies', *OECD Policy Conference on Economic Growth and Investment in Education, Washington, 16-20 October 1961*, Vol. III, p. 16.

An example of the anticipated rate of increase in one of the largest developing countries between 1950/51 and 1975/76 can be seen from Table 4. The anticipated growth in enrolment after the high and higher secondary stages of education worked out in relation to the needs of the economy is reflected in the figures set out in Table 5.

Professor Harbison's chapter on 'Human Resources and Development' sets out a number of human resource indicators which are useful in framing broad educational targets in both quantitative and qualitative terms. In *Education, Manpower and Economic Growth* (McGraw-Hill) Professors Harbison and Myers have set this approach out in detail under four categories. The first level relates to the 'underdeveloped countries', the second to 'partially developed countries', the third to the 'semi-advanced countries' and the fourth to the 'advanced countries'. The indices are the existing stock of high-level manpower (indicated by the number of teachers, universities, scientists, physicians, etc. per 10,000 of population); enrolment ratios in the various educational levels; and the different branches of study in higher education divided into science

Table 4 *Indices of growth of enrolment in primary and high school classes 1950/51 to 1960/61 and targets 1965/66 to 1975/76*[1]

Year	Schooling			All
	Primary class I-V	Middle class VI-VIII	High class IX-XI	
1950/51	100.0	100	100	100
1960/61	204.7	203.2	241.7	206.4
1965/66	258.3	316.1	383.3	272.3
1975/76	401.0	1 161.3	1 041.7	534.0

1. An unpublished study of the Perspective Planning Division, Indian Planning Council.

Table 5 *Estimated enrolment in higher education, 1961 and 1976 (in thousands)*

Type of course	1961	1976	Index 1976/1961
Higher degree course	1 043	3 041	292
Sub-professional diploma courses	789	2 010	255
	1 832	5 051	275

and technology on the one hand and the humanities, law, and arts on the other. These indices show different distributions of levels of education and different pressures from the expansion of the levels at various stages of economic growth. Thus in the 'underdeveloped countries' there is a pressure to expand secondary and higher education since the supply of qualified personnel is scarcely sufficient to replace foreigners and provide for the economic and political conduct of a modern State, and since the goal of universal primary education is clearly impossible to obtain for a long time. Further, the fact that a vast majority of the population is engaged in subsistence production both eliminates the possibilities of financing schools throughout the rural areas and at the same time places emphasis upon adult education and agricultural extension work as well as formal schooling. In the 'partially developed countries' the goal of universal primary education is given high priority in response to political pressures, and the bottleneck of lack of highly qualified persons is starting to open. In the 'semi-advanced countries' educational expansion moves forward rather rapidly, indicating that there is a threshold of development, which is both the cause and result of growth of education.

Inter-country comparisons can be misleading as well as useful, unless they are studied in terms of relative costs and variation of economic and administrative structure, as well as demographic analysis of the differences in age structure of different countries. The value of the comparative approach, when conducted with caution, is that it delimits the area within which the precise target is to be found by more detailed study or informed judgement, rather on the principle of bracketing techniques developed in naval gunfire. The Unesco regional conference for Africa, Latin America and Asia relied heavily upon norms of the kind described above in setting targets. The cost of the different levels of education was estimated on certain standards and projections made over periods varying from five to twenty years, in order to see what proportion of gross national product was involved. These regional targets were of course national, but provided the impetus and methodology for country-by-country studies. For the African region a preliminary country-by-country analysis has been made by Unesco and was the subject of a second conference of African ministers. In Latin America and Asia studies are proceeding at the national level and with the help of international and bilateral aid.

Another approach which should never be ignored is to look for irreversible trends in the growth and structure of the economy leading to inevitable educational needs. Since it is well established that economic growth brings about changes in the proportions of population and skills devoted to the different sectors of the economy, the simple process of taking given growth rates and extrapolating the structural tendencies associated with them indicates the minimum change in the levels and types of education which are required.

Educational expenditure, cost and financing

Educational expenditure in most countries comes from both public and private sources. The private expenditure is determined by individuals' expenditure patterns and those of non-governmental bodies concerned with education. Public expenditure on education is determined by budgetary allocations at the central and local level. The cost of education systems depends of course greatly upon the proportion of the population of school age. Thus in countries with high birth rates the burden on the economy is heavier than those with low rates of birth. For instance, children of 5 to 14 years of age make up 25 per cent of the population in Latin America, but only 17 per cent in Western Europe, i.e. in Latin America one out of four people should be in school while the proportion for Europe is one out of six. To the demographic disparity has to be added the wide variations in national income. The *World Social Report (1957)* stated that in Taiwan there were fifteen additional male children every year to be provided for by every thousand workers, whereas in the United Kingdom the ratio was only one per thousand.

The salaries of teachers amount to about three-quarters of the average educational budget. At the primary level this may amount to as much as 90 per cent of current expenditure on education and the proportion diminishes progressively with the second and higher levels of education. The average salary of a teacher in a primary school today in the economically developed countries is between one and a half and two times *per capita* income. Owing to the pattern of income distribution prevailing in developing countries teachers' salaries are normally a higher multiple of *per capita* income, and the cost of education is thereby proportionately higher. Professor Arthur Lewis estimates that the cost of giving primary education to every child is 0.8 per cent of national income in the U.S.A. and four per cent in Nigeria, the main reason being that while a primary school teacher gets less than one and a half times *per capita* national income in the U.S.A., in Nigeria he gets seven times. In the Asian countries, the salaries of teachers vary between $84 and $480 to $600 a year. *Per capita* income averaged $83 for the Asian region in 1961, and the lower figures given for teachers' income being the most widely prevalent, a rise in average teachers' salaries must be expected.

Pupil for pupil, the technical and scientific training at the highest level is the most expensive, but the 5 to 14 age group takes the largest part of current expenditure, which is up to 70 per cent in most European countries. Second level education tends to take in the same countries 15 to

25 per cent and the higher level between 10 and 15 per cent but as an economy develops, the trend is towards a higher percentage of expenditure for the second and higher levels of education. Expenditure on education other than for teachers' salaries is distributed between expenses of administration and maintenance, and capital expenditure on buildings and equipment.

A formula for assessing the cost of education has been set out by Professor Svennilson in association with Professors Edding and Elvin in the OECD paper 'Targets for Education in 1970'. He shows the total cost for each age group as

$$U_1 = P_1 \times e_1 \times t_1 \times w_1 \times (1 + k_1)$$

when P is the population in the age group, e is the enrolment ratio, t is the ratio of teacher to students, w is the average annual salary of teachers for that age group, and the ratio of total cost to teacher cost is $(1 + k_1)$, the relation of teacher costs to other than teacher costs being k_1. The total national expenditure is taken as the aggregate of the expenditure for all age groups. Different combinations of e_1, w_1, and k_1 will be possible within the total expenditure allotted.

The distribution of educational costs between recurrent and non-recurrent expenditure varies from country to country and depends upon the interpretations given to capital investment and maintenance in different countries. Comparisons of expenditure on education between countries is therefore difficult, and an added complication is that there are considerable variations as to the proportion of educational costs paid in the form of private fees and as to whether the public funds are raised centrally or locally. Subject to these difficulties, the range of public expenditure on education in relation to national income is revealed by Table 6.

For an economic assessment of the demand education makes on a country's resources it is necessary to add to educational expenditure (public and private) the opportunity costs of the pupils and teachers who might otherwise have been gainfully employed in production. These costs will vary to the extent to which the employment market would not be able to absorb the potential labour force lost. The distinction between money and real costs in educational expenditure is important. Where there exist unutilized supplies of educated labour, the 'intellectual and white collar unemployed' constitute an unused real resource. Measures which bring them into employment as teachers do not increase the 'real costs' in respect of the educational system. The same applies to building projects which can be undertaken with existing unused man hours and material. Foreign exchange costs for the annual import of equipment and skills not available nationally are normally of the order of 5 to 7 per cent, but a number of former non-self-governing territories

Table 6 *National income and public expenditure on education (1957-60)*[1]

Country	*Per capita* national income in U.S.$	Public expenditure on education *per capita* in U.S.$	Public expenditure on education as percentage of national income
U.S.A.	2 132	97.0	4.6
France	960	32.5	3.0
Turkey	460	10.0	2.2
Chile	310	9.6	2.4
Japan	250	14.6	5.7
Tunisia	159	6.7	3.4
Guatemala	155	3.5	2.4
Peru	124	4.0	5.9
Egypt	114	4.9	2.0
Thailand	102	2.9	1.7
Nigeria	70	1.3	1.9
India	66	1.3	3.7
Tanganyika	56	1.7	1.0
Pakistan	51	0.6	3.2
Burma	42	1.6	2.6

1. Based on *Basic Facts and Figures*, prepared by Statistics Division, Department of Social Sciences, Unesco.

still have many expatriate teachers paid for by grants from abroad.

Given decisions as to the level of investment in education and distribution among sectors, the question remains how education is best financed. Although education is becoming increasingly seen as an investment the practice is, of course, to finance it from current revenue, treating it as a social service. Thus the funds available for education depend upon the fiscal possibilities in those countries which tend to be inelastic and operating through inefficient systems. Low income countries raise on the average about 14 per cent of their national income in revenue while high income countries raise about 21 per cent. This is the framework of possibilities (on current assumptions) within which public educational expenditure has to be viewed. Within this framework there is the limit set by the other claims on revenue, educational expenditure usually being about a fifth or a quarter of overall government expenditure. Two of the largest developing countries for instance at present spend some 3 per cent of their GNP on their public social sector of which education takes up nearly two-thirds. The share of total government revenues falling to the Central Government is some three-fifths in the one case and three-quarters in the other.

The room for expansion of educational expenditure in these countries is clearly not great without either a rise in revenue or increased foreign aid, or additional efforts to reduce and spread the incidence of the cost. It is interesting to note that three of the economically well developed countries (U.S.A., United Kingdom, U.S.S.R.) with very different economic systems relied heavily in establishing their primary education systems upon breaking down the problem at the central level by drawing heavily upon local resources and initiatives. During the year 1929/30 for instance, only 4.6 per cent of the 53,647 schools in the U.S.S.R. engaged on the eradication of illiteracy were paid for out of the State budget, whereas 74.4 per cent were supported by local municipal, district and rural budgets, and 21 per cent were financed from extra-budgetary sources (trade unions, co-operatives, etc.). During the same financial year the number of schools in the U.S.S.R. with paid teachers was 50,965, and with unpaid teachers 46,142 (the latter coming from 'anti-illiteracy societies', factories and institutions of various kinds). In the case of the great expansion of the U.S.A. in the last century, the building of a school was one of the first charges on the resources of the newly established communities and voluntary teachers were widely used.

The financing of education is hindered in many countries by the fact that a large proportion of the population lives on subsistence production outside the cash economy. Importance must thus be attached to measures of adult education which can result in hastening the process of transition from the subsistence to the cash economy, in addition to action to push on with the focal areas likely to yield high revenue. Educational projects which hasten this transition not only increase production but bring sections of the population into a position where they can contribute to revenue.

External finance to aid education may take different forms:

1. Financing of development measures which increase the revenue-raising capacity of the countries needing aid, on the assumption that this will result in an increase of revenue allotted to education—the political demand for more educational facilities being very strong.
2. Adding to development loans or grants additional sums to take care of the educational implications of the increased production and development foreseen, i.e. treating education as an input.
3. Loans, credits, or grants for specific educational projects such as technical colleges, universities, etc.
4. Long-term loans at low rates of interest, credits or grants for the specific purpose of providing for a country's educational infrastructure, education being regarded as a basic service like the system of internal transport.

Education is at present usually not considered as an input which must be costed in advance and form part of a loan or grant. Yet there is much evidence of projects having been retarded or rendered unprofitable from the absence of the educated and trained manpower to get them properly started, and the necessary educational facilities to sustain its production and provide its growth. The *Report of the Commission on National Education in Pakistan* for instance states: 'Pakistan has already spent large sums of money on development projects and we are planning to make even greater expenditure in the future. The budgets for these projects provide for the cost of raw materials, labour and equipment, and also for foreign consultants and technicians. Yet no provision is made for the education and the training of those who will be required to maintain and operate the project once it has been completed or to staff a similar project elsewhere. The lack of trained manpower to create and support an industrialized economy has been a constant source of discouragement in our development effort, and it is high time we realized that to have skilled workers we must train them and that to train them we must have educational programmes that cost money. We do not build factories in the hope that once they are completed we will be able somehow to find the machinery necessary to operate them. Indeed the machinery is planned with the building. It is difficult to understand why we do not also plan for the personnel required to operate and maintain such projects.'[1]

If this practice were adopted by financial authorities the first step would be to determine the educational implications of a project, and then to cost these like other inputs. When a loan is being made to a country for a development project the cost of taking the educational implications into account as an input would have to be included in the amount of the loan. The procedure would be to construct out of the manpower demands for particular projects a series of educational pyramids which reflect the additional demand on the educational system. The additional cost of production would be included in the price of the commodities produced. This approach is criticized on the ground that the arguments used apply to other types of social overheads and that it is not feasible to atomize social infrastructure in this way: it is argued that projects closest to education in their economic implications are items like highways. The value of a highway accrues to the community as a whole over time and its cost-benefit ratio is not wholly measurable in terms of production. The public use the highway for many purposes, productive and non-productive, and it becomes part of the level of living of the community.

International loans and grants for specific projects such as technical colleges, schools and universities are already a reality, but the tendency is still to finance the 'bricks and mortar' or equipment aspects only. This leaves the economy to bear the recurrent charges involved (maintenance, teachers' salaries, etc.) and great care is obviously required to achieve the right balance between the capital and recurrent expenditure. The

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1. *Report of the Commission on National Education in Pakistan*. Ministry of Public Education, 1960, p. 334.

country's economic future and fiscal potentiality has to be assessed for the purpose of external borrowing as well as for gearing the educational system to development needs.

Education tends to be a smaller consumer of foreign exchange compared with many other types of project. But in cases involving high degrees of skill and laboratories, foreign expenditure may play an important part in providing equipment, machinery and the salaries of foreign instructors. It should be noted that a country's foreign exchange priorities are not necessarily the same as those for projects requiring local currency. In such cases the right course would seem to be to obligate the foreign exchange component of the educational cost of the project at the same priority that the project has itself. The rest of the foreign exchange should be distributed according to the prevailing priorities for foreign exchange on the condition that the government makes compensatory local currency available. Broadly, since education depends predominantly on resources (teachers, buildings) which are not transferable internationally except to a limited degree, foreign aid for educational purposes has to be directed at filling 'any gap which may exist between the physically possible and the fiscally possible' plus foreign exchange requirements resulting from the programmes and expert guidance from abroad. This amounts to a very large sum on a world basis and a substantial stepping up is required in the funds available for the external financing of education, as has been shown by the results of the Unesco Regional Conferences referred to above.

Allocations to education

Allocation procedures are at the heart of development planning. The task of the planner is to allocate resources in the manner which produces the maximum degree of consistency in the plan in terms of its objectives. To the extent that education is one of the goals rather than a means, it falls in principle outside allocation procedures. In practice, however, as we saw above, it is impossible to set out what part of education is a goal beyond perhaps a minimum social demand which is very difficult to define, and which will itself change as extra resources become available. For these reasons it is necessary to introduce a system of regular review of allocations. There is, however, a limitation to the degree of structural flexibility that can be introduced in the education system because of the necessary time periods involved. These problems are set out in Diez-Hochleitner's chapter in this volume. Education tends to be what economists call 'a lumpy investment', i.e. is not subject to manipulation in small pieces or over short periods. This means that countries with unsatisfactory educational systems should not delay putting them on a sound basis in the hope that it will be possible to temporize in respect of allocations to education and deal later with educational needs *ad hoc*, as they arise.

These reasons led the Regional Conferences convened by Unesco on educational planning in relation to economic development to urge that over long-term periods (ten years in the case of Latin America, twenty years in the case of Asia and Africa) specific proportions of GNP should be allocated to education as targets. Within these over-all targets the various methods of co-ordinating and interrelating educational expansion with development demands and needs would be applied.

The trend of expenditure by level of education is a guide to existing and past allocations.[1] Around 1952 the proportion of world enrolment in primary school of the school population was 83 per cent. By about 1959 this proportion had fallen to 77 per cent. Since the proportion of pupils in second and third level education had risen substantially and the unit costs are considerably greater at the higher levels one can conclude that the pattern of allocation has shifted markedly. Table 7 gives the distribution of enrolment by level around 1959 by continent and region.

At the Conference of African States on the Development of Education in Africa, Addis Ababa, 15-25 May 1961, a costing exercise for Middle Africa was undertaken which can give some idea of the target or standard costs for education by level. It must be noted that cost and expenditure are two different concepts, cost being useful for long-term planning and expenditure being valid for allocation analysis. By weighting the enrolment distribution for Middle and Southern Africa by the ratio of unit recurring costs by level a very rough estimation of financial allocation by level can be obtained for the region as: first level, 48 per cent; second level, 41 per cent; third level, 10 per cent.

At the Conference on Education and Economic and Social Development in Latin America, Santiago, 5-19 March 1962, a similar costing exercise was undertaken for Latin America. This exercise was based on more complete expenditure data and the resulting standard units are considered more valid. By applying the ratio of unit recurring costs to the student distribution a rough estimation of financial allocation by level can be obtained for the region as: first level, 47 per cent; second level, 34 per cent, third level, 19 per cent.

In the determination of allocations to the education sector and to various levels and types of education there are differences among countries with regard to decision-making processes in planning organization

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[1] Figures provided by Statistics Division, Department of Social Sciences, Unesco. They have to be interpreted with great care as the bookkeeping systems differ between countries. A special problem is the amount of non-specified expenditure, e.g. the cost of central administration which may not be allocated by level in all cases.

Table 7 *Distribution of enrolment by level, continent and region around 1959*

Continent and region	Percentage of total enrolment First level	 Second level	 Third level
World total	**77**	**20**	**2.8**
Africa	*88*	*11*	*0.9*
Northern Africa	84	14	2.1
Middle and Southern Africa	90	10	0.4
America	*74*	*21*	*5.1*
Northern America	67	26	7.0
Middle America	90	8	2.0
South America	85	13	1.9
Latin America	87	11	2
Asia (exluding U.S.S.R.)	*78*	*20*	*1.5*
South West Asia	83	15	1.6
South and Central Asia	64	34	2.4
South-East Asia	87	11	1.9
East Asia	82	17	1.1
Europe (excluding U.S.S.R.)	*71*	*26*	*2.6*
Northern and Western Europe	66	32	2.3
Central Europe	72	26	2.9
Southern Europe	78	19	2.7
Oceania	*74*	*22*	*3.3*
Australia and New Zealand	71	25	3.8
Pacific Islands	94	6	0.2
U.S.S.R.	*80*	*13*	*6.5*

and in education ministries as well as in procedures for the implementation of decisions. These variations depend largely on the degree and nature of planning, the extent of administrative centralization, the stage of development, and the relative size of private education. The following short descriptions[1] of these processes in some sample countries illustrate briefly how the determination of such allocations differs among countries.

In the United States there is little explicit central economic planning although governmental agencies provide the projections and other information that are needed for planning. Over-all allocations to education are the result of separate decisions by Federal, State and local governments as well as organizations and individuals concerned with private schools. The individual States have the legal responsibility for providing public elementary and secondary education. These States have delegated much of the administration and budgetary control to local levels of government. Each State has its own ordinances regarding standards and budgetary procedures to which the local school government must conform. Also, most States provide grants from State revenues to local school governments. However, local school authorities have considerable freedom of action within the constraints of these State regulations. The States also maintain and finance institutions of higher education. Funds allocated to public education must be incorporated into the budget of the governmental unit and be approved either by the legislature or by the public directly. There are fifty States and over 40,000 local school systems with the legal power to levy taxes and disburse funds for the purpose of providing education. There are, however, arrangements that provide some co-ordination. The Federal Government and almost all of the States maintain Departments of Education which collect data and perform research on educational policies, needs for classrooms and teachers, and on future manpower requirements. State mandated educational standards and curricula are based largely on these studies. In addition State and Federal governments offer grants-in-aid, often on a matching basis, to local schools for specific programmes favoured by the higher level of government because of estimates of future educational needs. These funds are a strong inducement to adjust allocations within the educational sector in accordance with national objectives.

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[1] From a paper submitted by the Economic Development Analysis Division, Unesco, to the United Nations, Bureau of Social Affairs, April 1963.

India has a comprehensive five-year planning and decentralized administrative arrangements. Education is one of the sectors in the over-all plan. Proposals for education are submitted to the Planning Commission, both by education departments and universities at the State level and by the Ministry of Education and the University Grants Commission at the national level. These proposals are prepared by a Working Group made up of representatives of the Ministry of Education, the Planning Commission and State education authorities as a result of evaluation and discussion of reports on each of the major fields of education. The Planning Commission drafts the final plan for both State and national educational programmes after consideration of the proposals for each sector and the available resources. The implementation of the plan is compulsory once it has been approved by the National Development Council and the legislature. Responsibility for implementation lies in the case of State plans with the education authorities of each State, and in the case of central plans with the Minister of Education. The central government assists the State governments by making grants for specific projects. Plans are implemented on a yearly basis, the outlays and targets being determined from year to year on the recommendations of the working groups.

In the Soviet Union the over-all scope and nature of all economic policies is determined by the Central Committee of the Communist Party and the Council of Ministers of the U.S.S.R. and embodied in both given year 'perspective' plans and annual plans. Channels of administration of education in the Soviet Union converge at the top and while there is room for some local discretion, the basic policies that shape the character and extent of education are determined centrally. The major factor influencing decisions about the education sector are estimated manpower, social and cultural needs, and the capacity of the educational system. General policies are embodied into laws or regulations by the Council of Ministers of the U.S.S.R. and then the Ministry of Education of each of the republics develops a set of consistent detailed ordinances which are ratified and enforced by the republics. Teacher training, higher education, and special types of education are administered by other ministries of the central government although the implementation of ordinances often falls to local governments. Later chapters by Professor Strumilin and Dr. Skorov give a full description of the Soviet system of educational planning for economic development.

Yugoslavia employs a more decentralized type of comprehensive direct planning than the Soviet Union. Education in the over-all federal plan depends on the planned requirements and general development of the country as a whole and is concerned mainly with expanding educational facilities where needed and with the co-ordination of educational and industrial expansion. Subject to directive of the federal authorities regarding general economic policy the legal responsibility in education is in the hands of republics, districts, and municipalities whose departments of economic planning draw up detailed five-year economic development plans that include a plan for education. The task of carrying out the plan for education falls on educational authorities in each political-territorial unit. Industrial units, firms, political organizations, trade unions, and other groups also play some part in carrying out the plans.

In France the Planning Commission prepares a four- or five-year economic plan for public capital expenditures. This plan contains recommendations for increased educational facilities and is prepared by the Education Committee, one of twenty industrial committees in the Planning Commission. The recommendations of the Educational Committee encompass (a) the over-all volume of public investment in education; (b) the amount of investment to be devoted to each type of secondary school and each branch of higher education; (c) the geographical allocation of educational investments; and (d) administrative and technical measures for the implementation of the plan. Information on these matters comes from inquiries among regional education administrators and national surveys of relevant factors. The recommendations of all twenty committees are jointly considered by the Commissariat Général du Plan and a final programme is determined that is consistent with the over-all plan and available resources. These recommendations become binding only when approved by Parliament. Annual expenditures are determined through conventional budgetary procedures. The Ministry of National Education, which has no special educational planning machinery, proposes a budget to the Ministry of Finance which is discussed and finally incorporated into the over-all budget presented to Parliament. Approved legislation is implemented by the Ministry of Education which employs personnel and disburses funds. Private school enrolment is about 20 per cent of total enrolment in French schools. The Ministry of National Education exerts some influence over the curriculum and type of private schools by a system of varying subventions.

In most of the developing countries a public investment programme constitutes the core of economic development plans. Sometimes in addition to development programmes for the public sector, they include a programme for the private sector. The new development plan of the Federation of Nigeria, for instance, is of this type. Administratively, Nigeria falls into the category of countries having a federal structure, the individual regions having a fair degree of autonomy in education as in all other matters of administration.

The over-all educational plan, and its components—the individual educational programmes of the Federal Government and the regions—are integrated with and related to the objectives of the National Economic Development Plan. As part of the preparation for the National Plan, the Federal Government, in consultation with the regional ministries, had commissioned, in 1959, a study of certain aspects of educational development in Nigeria. As a result of this study (the Ashby report) and with the assistance of other foreign experts a comprehensive plan for educational development for the country during the period 1961-70 was outlined. The latter has been the basis for the educational programme and its allocation pattern among levels and types of education contained in the National Development Plan. The purely financial aspects of educational development are discussed by the National Economic Council. The latter reviews the economic development plans of the various regions and the Federal Government—which include the educational programme—and the National Development Plan. After the National Economic Council has passed on the plan, it is presented to the National Parliament. Parliament, after debate, eventually takes the legislative action needed and the National Plan acquires legal status.

In the Ivory Coast, the Ministry of Education arrives at its development budget by using past trends in enrolment and expenditure as a basis of its projections, increasing each component of education by a certain percentage thought to represent the additional requirements for educational development. There was little evident relationship between the educational programme and the other parts or projects of the capital budget. The Ministry of Education is responsible for the 'general' aspect of education—primary, secondary and higher education, and one trade school—and the various specialized ministries handle manpower needed in their own sectors. Thus it was difficult to arrive at the expanse and structure of the over-all educational programme of the country, or to know the total of resources allocated to the educational sector and their distribution between levels and types of education. In May 1961 a central planning organization was created by ministerial decree within the Ministry of Planning, Finance and Economy. This central body is responsible for the preparation of a medium- and long-term development programme, and the preliminary research and compilation of technical information required for this purpose. It is to be expected that when the plan is ready, it will also provide for a comprehensive and more consistent allocation of resources for the educational sector relating it to the development strategy of the country.

The situation country by country as to the methods of making allocations to education is set out in a joint publication by the International Bureau of Education and Unesco entitled *Educational Planning* published in 1962. It is based on replies to a questionnaire issued by the International Bureau to seventy-five countries. The following extract from the introduction to this publication summarizes the position:

'From the replies received and despite the very different and sometimes even contraditory data it would seem possible already to reach the following conclusions:

'1. Provision for the organized general planning of education is made in only 40 per cent of the countries which sent replies for the inquiry but there is a tendency everywhere to lay down long-term development programmes for economic and social life and in these programmes education plays an important role.

'2. Co-ordination between the various State activities, including education, seems to be effected on an increasingly rational basis in order to "channel" all the resources useful for the country's integral development programme and without excluding any contribution made by private initiative wherever this latter exists.

'3. Where no provision is made for general or integral educational planning in the strict sense, there are nearly always plans covering a more or less long period for providing the material conditions necessary to educational development (plans for school building, the recruitment of teachers, the allocation of increased funds to education).

'4. There is a tendency to give gradually more importance to scientific and technical education at advanced level with a view to satisfying the growing demand for qualified personnel in industry and in scientific research.

'5. Educational planning services are either functioning or being set up at the Ministry of Education in approximately 40 per cent of the countries which replied to the questionnaire. In the other countries special commissions are set up according to needs as they arise. In those countries where there is general planning of all State activities a senior body is responsible for planning and usually has an education section.

'6. No uniform procedure is followed in the preparation and drawing up of educational development plans. In some countries the procedure is fixed in advance whereas in others it is determined more or less empirically by the nature of the plan.

'7. The drawing up of plans is preceded by preliminary work and investigation in which social, economic, political and population factors affecting educational development are taken into consideration but seldom is there any specific procedure for the quantitative and qualitative determination of needs and resources and for making forecasts.

'8. It is found, generally speaking, that scientific means for compiling statistics and methods of evaluating results have not yet been sufficiently developed to facilitate the work of educational planning.

'9. The training of those who are responsible for educational planning is even less satisfactory. In only a few countries is it organized, although in many it is causing concern, and assistance is obtained from experts and others who specialize in matters relating to educational development and administration. Collaboration between administrators, teachers, experts and technical staff seems to take place by itself whenever the planning of educational expansion or reform is undertaken.'

Assessing the returns on education

This question has been left purposely to the end. One reason is the difficulty of measuring the benefits of education; another is that to the extent that an educational system is an indispensable derivative or goal of the development plan it is not necessary to estimate its returns because no possibilities of substitution arise. On the other hand, in order to assess the value of investment in education beyond that point, as compared with other investment, returns should, strictly, be forecast. For this reason we conclude by noting the extremely interesting research undertaken in recent years to show retroactively the proportionate contribution education has made to economic growth in particular countries. These studies indicate that the major part of the growth in production in developed countries over the last half century cannot be accounted for by the inputs of physical capital, man hours and natural resources. The major part must be ascribed to technical progress and human factors :

among which education plays a prominent role. Professor Solow estimated that only 10 per cent of the growth could be accounted for by population growth and physical resources, leaving the remaining 90 per cent due to residual factors falling under the general heading of technological progress.[1] Dr. Massel has published an independent estimate for United States manufacturing industry taken alone, which came to the same conclusion.[2] In Europe, Professor Aukrust made calculations for Norway for the whole of national production between 1900 and 1955 and his conclusions were similar.[3] In the United Kingdom, Professors Reddaway and Smith have shown that capital and labour inputs accounted for only a quarter of the increased output per head in manufacturing industries between 1948 and 1954.[4] This type of approach is based on national accounts procedures and the statistics are used within the theoretical framework of the Cobb-Douglas production function. This form of analysis has been criticized on the ground that actual production functions, unlike the Cobb-Douglas function, are not homogeneous and that the marginal productivity of capital is more relevant to assessing returns than the average product of capital. The criticisms of the approach are not directed at the importance of the role of education, but at the measurement procedures involved and the assumptions made as to the basis on which the factors of production are actually distributed in the economies concerned.

However this may be, the residual factor approach is upheld in many quarters as an important method, utilizing standard national accounting statistics, of estimating the contribution of increased units of labour and capital to economic growth. A difficulty with this type of analysis is that the importance of the residual factor varies at different stages of development, tending to be lower in developing countries, and that the existing statistical studies mainly apply to the old developed countries where data is available. Certain of the developing countries, however, have been reanalysed by Professor Schultz[5] and he gives the following figures in respect of their agricultural production in comparison with the Member States. In the United States (between 1910-14 and 1945-49) only 17 per cent of additional output was accounted for by increased inputs, leaving

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1. R. Solow, 'Technical Change and the Aggregate Production Function', *The Review of Economics and Statistics*, Vol. XXIX, No. 3, Aug. 1957.
2. B. Massel, 'Capital Formation's Technological Change in U.S. Manufacturing', *The Review of Economics and Statistics*, Vol. XLII, No. 2, Aug. 1960.
3. O. Aukrust, 'Investment and Economic Growth', *Productivity Measurement Review*, No. 16, 1959, pp. 35-50. (Paris, OECD.)
4. W. B. Reddaway and A. D. Smith, 'Progress in British Manufacturing Industries in the period 1949-1954', *Economic Journal*, March 1960.
5. T. S. Schultz, 'Economic Prospects of Primary Products', In: Ellis, Howard S. (ed.) *Economic Development for Latin America* (Proceedings of a conference held by the International Economic Association), Chap. 11, pp. 308-31. London, Macmillan, 1961.

83 per cent attributable to the 'residual' factor. For Argentina (1912-14 to 1945-49) the equivalent percentage attributable to the 'residual factor' was 62, for Brazil (1925-29 to 1945-49) it was 45, and for Mexico (1925-29 to 1945-49) the percentage was 50.

Interesting historical cases are those of Japan and Denmark which were lacking in natural resources but obtained an earlier and higher rate of growth than their neighbour countries which were richly endowed with physical resources. In each of these cases educational development ran well in advance of that of their neighbours. The problem is in such cases to determine how far the relatively higher investment in education was cause or effect of their economic development. Subsequent examples of the remarkable impact of the human skills on economic growth have been those of the Federal Republic of Germany in the post-war years and Israel (both of which profited from the immigration of skilled population) and that of Switzerland.

The case of Denmark is particularly interesting. When the opening up of the farm lands of the New World took place in the last century the agricultural systems of the European countries received very serious blows. Denmark was threatened like the other countries. Historians take the view that it was the fact that compulsory education had existed for some time which was the decisive influence enabling the Danish farmers to accept and carry through those far-reaching changes in their productive activity which remain the basis of Denmark's prosperity today. The case of Japan also merits close study. The sudden rise of the Japanese economy with the Meiji era is associated by economic historians with the fact that one of the first measures after the fall of the Shogounat was the establishment of a system of compulsory universal education which practically eliminated illiteracy by the end of the nineteenth century. Meantime India and China, rich in natural resources where Japan was poor, remained with high illiteracy and large-scale underdevelopment.

Evidence as to the returns from education derived from analysis of the aggregate production function and historical examples are impressive but difficult to use as an immediate guide to action. In the case of the former, even if it is possible to demonstrate that growth depends upon a powerful residual factor associated with human organization and skills, it is difficult to break this factor down so as to isolate its educational component. In the case of the latter the same historical circumstances do not easily reflect themselves.[1]

Another approach to the problem of assessing the rate of return on education as a form of investment is to aggregate the salaries earned over the working life of various occupations discounted for interest, and to compare this total with the cost of education for those occupations, adding both compound interest and opportunity costs. On such a basis Professor Becker calculated for the National Bureau of Economic Research that as of 1950 the United States male population was earning 14.8 per cent return on what they had privately invested in obtaining their high-school, college and university education, and that when public costs were added, the rate was 11 per cent.[1] Thus we see investment in such education paying itself off over nine years. Statistics enabling this exercise to be undertaken are only available for a limited number of countries, and since the countries concerned are those which have already reached an advanced stage of development, their application to economically underdeveloped countries needs caution. The figures relate to investment in education in a society already having universal schooling, highly organized educational facilities and a lively employment market. Returns of these dimensions will therefore be restricted, in an economically underdeveloped country, to that sector of education which is already well organized and whose product is in active demand.

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[1] See: E. Denison, *Sources of Economic Growth* (New York, Committee for Economic Development, 1962), for estimate of share of education in residual factor.

This method of assessing the returns on education is also open to the criticism that, since it is calculated on a person's lifetime, long-term assumptions are involved about the earnings of different occupations, and about future wage rates and levels of employment, which are necessarily speculative. Moreover, although this method might be a useful guide to a person considering whether or not to send his son to college, it does not follow that the sum of the differentials where added would represent the total national gain. Some individuals may have gained at the expense of others. Moreover all of the gain cannot be attributed to education as there are important correlations between education and parental income.

Finally there is what may be called the common sense assessment of returns which can perhaps be illustrated by the following extract from the paper by Professer John T. Dunlop, 'Evaluation of Factors Affecting Productivity', submitted to the Second World Economic Congress in September 1962: 'It would be interesting to speculate upon what would have been the increase in productivity in the past hundred years if science, the educational system, and management organizations had remained unchanged even though all other factors operative to increased productivity had been fully exploited. While the question is non-operational, there would no doubt be a consensus that the increase in productivity would have been only a very small fraction of the actual record in the advanced countries. It would be an error to derogate the role of capital formation, training the labour force, and motivation, but their significance is more short-run and more limited in ultimate impact.' This growing 'consensus' is reflected in the increased emphasis that statesmen and populations of the developing countries are placing upon education.

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[1] Gary Becker; lecture given before the Economic Development Workshop, University of Chicago, 5 Feb. 1959.

Chapter II

Human resources and development

by Frederick Harbison, Director
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The almost universal quest of nations for development is in essence a revolution which has no precedent in history. The underdeveloped countries are in a state of revolt against ignorance, poverty, disease and dominance by stronger nations. The advanced countries too are committed to development, and their aspirations are no longer earthbound, but extend as well to the exploration of outer space and other planets.

Development means various things to different groups. In many countries it is associated with industrialization. In some it symbolizes the achievement of independence. In others it encompasses opportunity for education, the improvement of health, the construction of a huge dam, the building of skyscrapers, steel mills and television networks in once primitive lands, or even the creation of a new nation's capital in an underdeveloped wilderness. Sociologists and political scientists think of development as the process of modernization which involves the building of social and political institutions. Economists tend to equate it with economic growth and concern themselves with the process of savings and investment and the increase of national income and productivity.

For our purposes, the best definition of development is contained in the United Nations Development Decade Report: 'Development is growth plus change; change in turn is social and cultural as well as economic, and qualitative as well as quantitative.'

Development is brought about not by passive entities such as natural resources and material capital but by human beings who are the active agents of change and bring about production of physical resource. This manual is concerned with the development of human agents, or human resources as they are called, and its strategic role in general economic and social planning.

In broad terms, human resource development is the process of building the knowlege, the skills, the working abilities, and the innate capacities of all of the people in a society.

Human resources are developed in many ways. The most obvious is by formal education, beginning with primary or first-level education, continuing with various forms of secondary education, and then higher education including the colleges, universities, and higher technical institutes. Human resources are also further developed 'on-the-job', through systematic or informal training programmes in employing institutions, private or public. A third way is self-development, as individuals seek to acquire greater knowledge, skills or capacities through preparation on their own initiative—either by taking formal or correspondence courses, by reading, or by learning from others in informal contacts. Self-development is directly related to incentives for training and for entering one occupation as opposed to another. Two other means of human resource development are improvements in the health of the working population, through better medical and public health programmes, and improvements in nutrition.

Economists have long been aware of the importance of human resource development, Adam Smith, for example, specifically included 'the acquired and useful abilities of all inhabitants or members of society' in his concept of fixed capital.[1] Marshall emphasized the importance of education 'as a national investment' and in his view 'the most valuable of all capital is that invested in human beings'.[2] And today among modern economists, the processes of investment in man and his development are receiving widespread attention.

The various attempts by economists to measure the contribution of education, health and nutrition to economic growth are constructive, and some of these are reviewed in the next chapter. But, the concept that human resource development either can or should be analysed solely in economic terms is very misleading. It is incorrect to assume, even as an analytical exercise, that the central purpose of human resource development is to maximize man's contribution to the creation of productive goods and services. Nor is it realistic to measure the return on education solely in terms of increases in individual incomes or the income of the economy as a whole. And increases in productivity certainly should not be taken as the exclusive test of the effectiveness of human resource development.

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[1] Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations* (Cannan edition, reissued by the Modern Library), New York, Random House, 1937, Book II, pp. 265-6.

[2] *Principles of Economics* (eighth edition, 1930, London, Macmillan, pp. 216, 564). John Vaizey, *The Economics of Education*, London, Faber and Faber, 1962, p. 23. Chapter I: 'What some Economists said about Education', summarizes the view of English economists and Karl Marx on the economic importance of education.

On the other hand, it is equally fallacious to argue that education and other means of human development should be considered 'human rights' irrespective of their contribution to production of useful goods and services. Education for citizenship, education for 'life adjustment', or education for enhancement of the freedom, dignity and worth of man are laudable goals, but they express only in part the aspirations of modern societies. The purely humanistic approach, like the limited economic approach to human resource development, distorts the true meaning of the aspirations of modern man and modern societies.

But, in reality, there need be no conflict between the economists and the humanists. If one of the major goals of nearly all societies today is rapid economic growth, then programmes of human resource development must be designed to provide the knowledge, the skills and the incentives required by a productive economy. If one rejects the notion that investments in education must be productive, then he should be prepared also to reject the goal of rapid economic progress. But if he accepts the goal of rapid economic growth and the idea that education must be oriented in significant respects to promote it, he need not thereby reject a humanitarian concept of the role of education. The development of man for himself may still be considered the ultimate end, but economic progress can also be one of the principal means of attaining it. And human resource development systems can be designed which intentionally help to increase production of essential goods and services and which at the same time preserve and enhance the freedom, dignity, and worth of the individual.

The goals of modern societies, as we have already stressed, are political and social as well as economic. Human resource development is a necessary condition for achieving all of them. A country needs educated political leaders, lawyers and judges, trained engineers, doctors, managers, artists, writers, craftsmen and journalists to spur its development. In an advanced economy the capacities of man are extensively developed; in a primitive country they are for the most part underdeveloped. If a country is unable to develop its human resources, it cannot develop much else, whether it be a modern political and social structure, or a sense of national unity, or higher standards of material welfare.

Human resource development, therefore, is probably a more realistic and reliable indicator of the stage of modernization or growth than any other single measure, because it is a *necessary* condition for all kinds of growth—social, political, cultural or economic. Admittedly, however, it is not a *sufficient* condition. For example, a country may have well-developed human resources, and its growth may be retarded by failure to develop the organizations and institutions which characterize a progressive society. Investments in man will not promote economic growth unless accompanied by appropriate rates of saving and investment of capital in productive enterprises. Some countries with underdeveloped human resources are materially rich because they are blessed with valuable natural resources, such as for example, Kuwait or Saudi Arabia. And, these countries can import both material and human capital to develop these natural resources. Other countries with relatively well developed human resources at certain educational levels, such as, for example Egypt, are poor primarily because they lack adequate natural resources. A country's physical location, its terms of trade, and its political relationships with other countries will all have a bearing on its growth.

Human resource development, therefore, does not explain everything, and one should not expect to find a perfect correlation between it and political stability, cultural maturity, or economic growth. But one may argue that the appraisal of human resource development is perhaps a more logical starting point for the analysis of stages and potentials of growth than, for example, national income, energy consumption *per capita*, the productivity of agriculture or industry, or capital investment per head. And even if this is not thought by some to be a proper starting point, an approach of this kind is justified because the analysis of human resources is perhaps the most underdeveloped area of knowledge in the rapidly expanding field of development.

The following table illustrates various stages of development as measured by selected 'human resource indicators', as well as the general relationship between human resource development and gross national product.[1]

A strategy of human resource development

It is customary today for many countries to formulate plans for economic and social development. These plans, if properly designed and widely accepted, present in essence a strategy for attainment of specified goals. Every plan, in our judgement, should include as an essential element a strategy of human resource development. Admittedly, however, the weakest sections of nearly all development plans are those dealing with

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[1] For a complete statistical analysis as well as identification of individual countries in the four categories, see F. Harbison and Ch. Myers, *Education, Manpower and Economic Growth* (New York, Toronto, London, McGraw-Hill, 1964), Chapter III.

Table 8 *Stages of development measured by selected human resource indicators*

Indicators	Countries			
	Under-developed	Partially developed	Semi-advanced	Advanced
GNP *per capita* (U.S. dollars)	84	182	380	1 100
First level enrolment ratio (primary)	22	42	62	73
Second level enrolment ratio (secondary)	2.7	12	27	59
Third level enrolment ratio (higher)	0.15	1.6	5	11
Teachers (first and second level) per 10,000 population	17	38	53	80
Scientists and engineers per 10,000 population	0.6	3	25	42
Physicians and dentists per 10,000 population	0.5	3	8	15

education, training, and other aspects of building the capacities of people. One of the purposes of this manual, therefore, is to suggest some approaches and methods of analysis for more systematic consideration of human resource development problems.

There are at least six essential elements in a strategy of human resource development: (a) an assessment of manpower requirements; (b) a programme for development of formal education; (c) a programme for strengthening training-in-employment; (d) a programme for building of incentives; (e) a programme for health development; and (f) appropriate machinery for integration of human resource planning with general development planning. Other measures for improvement of levels of living such as food consumption and nutrition, employment, working conditions, housing, clothing, social security, recreation and human freedoms also have a bearing on human resource development, but they are logically treated as hoped-for consequences of general social and economic growth.

This manual is concerned primarily with element (b), the programming for development of formal education. However, elements (a) and (c) are stressed in the chapter on manpower assessments. Element (d) building incentives, is not discussed directly, but is implied in the analysis of the other elements. Element (e), health development, is vitally important but lies largely beyond the scope of this particular manual. And element (f), machinery for human resource planning, is discussed both in this chapter and in another which is more specifically limited to educational planning.

At this point, let us consider the role of the human resource planner, or in more precise terms, the human resource development strategist. He is usually by background a specialist on some phase of human resource development. His speciality may be education, or manpower analysis, or labour economics, or on-the-job training, or public health services, or some other area of human resources. The really effective human resource strategist, however, is also a generalist in the sense that he perceives the relationship between progress in his own specialized field and to other elements in a human resource development strategy; and he also understands the relationship of his specialized field to general economic and social development. The human resource development strategist, therefore, is much more than an expert in a narrowly defined field of knowledge. He should be a designer of change in a broad area of human activity; he should think of himself as a development planner rather than merely as a specialist.

This manual is intended primarily for persons who are concerned with planning of formal education, and particularly for those who are likely to become strategists as defined above. At the outset, it is important for the planner to understand the context within which the development of formal education will take place.

Human resource development is a lifetime process and extends far beyond the period of pre-employment education. Experience is acquired in employment, and training also takes place on the job. In most newly developing countries, educated persons are in short supply; but experienced and well-trained persons who also have education are in even shorter supply. The employing organizations, whether they be government ministries, industrial plants, commercial organizations, or plantations, are both consumers of educated manpower and potential producers of experienced and trained manpower. Thus, the education planner should fully understand the relationship between formal education and training on the job in a particular country. Essentially, education involves the acquisition of general knowledge and development of basic mental capacities. Training involves the development of specific skills which are needed to perform a particular job or series of jobs. In economic terms, a great deal of money will be wasted in education unless appropriate measures are taken also to develop skills in the process of employment. This is why it is essential for the educational planner to concern himself, or to see that others develop concern, with procedures and programmes of on-the-job development, particularly in the field of vocational training. Indeed, many kinds of industrial and commercial training are better conducted by employing establishments than by schools. Since funds for education are limited in every society, the wise educational planner will attempt to shift as much responsibility as possible for training to the employing establishments, and leave to formal education only those training assignments which obviously lie beyond the capacity of such establishments.

It is also very important, in any developing economy, that there be proper incentives to encourage men and women to prepare for and engage in the kinds of productive activity needed for accelerated growth. To accomplish this, the compensation (both financial and non-financial) of an individual should be related to the importance of his job in the development of the economy. And the relative importance of jobs should be based not on tradition or heritage from former colonial régimes, but on an assessment of the manpower needs of the developing economy.

If, for example, agricultural officers or village workers are desperately needed in rural areas to carry forward a programme of modernizing traditional agriculture, their pay may have to exceed that of professionally trained people who have desk jobs in the cities. If a technician with limited education can perform work normally assigned to an engineer, he should receive the same pay as the engineer on that job. If science and mathematics teachers are urgently needed in secondary schools, their rates of compensation should be higher than other less urgently needed teachers (whether university graduates or not) and perhaps higher also than professionally trained people in some other less essential activities. If technicians, nurses, and foremen are in very short supply (as is the case in most modernizing countries), their rates of pay may need to be higher than those of some university graduates holding down administrative jobs for which many persons could qualify. In some cases, the medical technician or the agricultural assistant who is willing to live in the bush deserves to be paid as much as the doctor or agronomist who insists upon living in the city. The analysis of appropriate compensation structures, therefore, is an important part of human resource development.

The point which has been stressed is that investments in education alone do not constitute an effective programme of human resource development. The building of incentives and the training of employed manpower are necessary both as a means of economizing on formal education and as a means of making the investments in it really productive. And in formulating the education plan, moreover, it is essential to have as accurate a picture as possible of the nature of manpower problems of the developing country. They fall generally into two categories: (a) the shortage of persons with critical knowledge and skills, and (b) surplus labour, both in the form of unskilled as well as educated manpower. These should be identified by a manpower assessment. Usually, the making of manpower assessments lies beyond the scope of the educational planner. It is absolutely essential, however, that he understand both the problems and the limitations of manpower assessments so that he may interpret them with some sophistication. In the past, educational planners have made mistakes because they have ignored the need for assessments of manpower problems; on the other hand, they are equally prone to make gross errors by accepting them uncritically.

Obviously, a general understanding of a country's growth problems, political and social as well as economic, is essential, as is familiarity with formal development plans if they are available. The education planner should never let himself become isolated from the main stream of development planning. Many development economists still hold the view that education, health, and manpower development are 'residual social problems' which should have claim on a country's resources only after other more urgent economic demands have been satisfied. Such attitudes will not be changed by mere oratory on the importance of the human factor. Progress will be made only when the human resource development strategist becomes a member of the general development team.

The role of the education planner as a human resource development strategist now becomes more clear. In addition to being an expert in his own right in a particular field of knowledge, he is a 'transmission belt' of concepts about human resources in development. He is in this broad area an integrator of ideas and programmes. Because his field is human affairs, he perhaps needs more political insight, social perspective and general knowledge than the economic specialist or the statistician. And last but not least, he must be able to communicate with others and effectively sell a sound programme of human resource development in environments which invariably offer stiff and stubborn resistance.

Machinery for development planning

Most governments today have some kind of planning organization. It may be a ministry of economic and social planning; it may be a special unit in the office of the Prime Minister or President of the country. Its functions may be advisory, operational or combinations of both; it may have influence, or it may be largely window-dressing. In any case the first task of the human resource development strategist is to find out where the planning function is located, and to ascertain to the best of his ability where effective decision-making power for development is located. Until this is done, little progress can be made in integrating programmes of human resource development with general social and economic planning.

In many countries, the principal government ministries are responsible for submitting plans for development within their respective jurisdictions. Accordingly, the building of a planning organization within the ministry of education is required. In Chapter IV, Mr. Ricardo Diez-Hochleitner has presented a systematic approach to educational planning at this level, as well as suggestions for its broader integration with other planning groups.

However, it is desirable to have a human resources planning organization to integrate education plans and other human resource development programmes in the general planning process. Such machinery was stressed in the Plan for African Educational Development which was formulated at the Unesco-ECA Conference at Addis Ababa in 1961. And since that time, several countries have taken some steps along this line. The possible functions of such machinery, as suggested in a previous article by the author, are:[1]

1. The determination of priorities in the strategy of human resource development, and the continuous re-assessment of priorities as the programme progresses.
2. The assessment of human resource problems through periodic manpower analysis.
3. The promotion and stimulation of planning activity on the part of the ministries represented on the board as well as on the part of employer and labour organizations.
4. The co-ordination of the above planning activities.
5. The integration of human resource development strategy with other components of the country's plans of economic and political development.
6. The general review of all activity connected with human resource development, and periodic evaluation of the work of the various agencies which assume responsibility for it.
7. The selection and design of research projects which may be useful for the formulation, implementation, and evaluation of the strategy of human resource development.
8. Co-ordination and approval at the country level of all requests for external aid and technical assistance involving human resource development.

The machinery which is established, however, is not nearly as important as the persons who provide its leadership and compose its secretariat. Obviously, various ministries have vital interests in human resource development and should be represented on any board, commission, or sub-committee which may be established. And it is impossible to specify *a priori* where the leadership responsibility should rest.

Some people have argued that leadership of a human resource development board is a logical extension of the responsiblity of the ministry of education. Others have suggested that it should be located in the ministry of labour. Where strong general planning machinery exists, there is good reason to make human resource planning a subfunction of the general planning organization. The decision in each case may be made quite rightly on political grounds, rather than in accordance with a well-drawn organization chart.

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[1] Frederick Harbison 'Human Resources Development Planning in Medernizing Economies', *International Labour Review*, May 1962

It is essential, however, that integrated planning of human resource development be done somewhere. The consideration of human resource development problems in pieces serves only to confuse rather than to advance the general planning process. The building of a strategy of human resource development, however, requires competent people. Thus a major concern of the planning strategist must be to locate, inspire, train, and develop such people. This, in many newly developing countries, is often the most difficult of all tasks, requiring perseverance and enthusiasm far beyond the confines of technical competence.

Chapter III

The economics of education in the U.S.S.R.[1]

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In the U.S.S.R. the education and upbringing of the younger generation are closely associated with life and socially useful work. Adults may, while actually engaged in production, continue their studies according to their own personal vocation and preferences. In conformity with the objectives of the new programme of the Communist Party of the Soviet Union, this system of education promotes the all-round development of the members of communist society, thus contributing towards the solution of one of the most important of all social problems: the elimination of the essential differences between intellectual and physical work.

The educational system also promotes the achievement of the country's immediate economic tasks since it is a potent factor for progress in this sphere, and also for the rapid increase of productivity.

In the U.S.S.R. education at all levels, from primary to higher, is free. It is financed mainly from the accumulation of collective socialist productions; and only in a small part from taxation. Increasing attention is being given to estimating the returns to be expected from investments in this field of cultural construction.

Private entrepreneurs are usually guided in making investments by the amount of profit they hope to derive from them, without considering the interests of other people or of society as a whole. Profit rates, however, depend also on various factors affected by the general situation, such as spontaneous fluctuations in market prices, booms and slumps, competition of monopolies, and speculations on the stock exchange, strikes, etc. In the socialist countries, on the other hand, where private capital and, consequently, variations in the general situation, play no part, such a criterion as a high profit rate cannot provide a sufficiently accurate or objective yardstick for measuring the return from investments, mainly because the interests of the whole society must be taken fully into consideration when the expenditure of sums derived from collective saving is involved. The profit rate never represents more than a part of the return—only that part received by the owner of a given enterprise. The total return from a particular investment can be measured only by the resulting increase in the social productivity of labour since this not only raises the rate of profit for a given enterprise but also reduces the cost of a certain category of products for the whole of society.

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[1] This article was published in the Unesco *International Social Science Journal*, Vol. XIV, No. 4, 1962, pp. 633-46.

The productivity of labour is determined by various factors, the most important of which are a high standard of technology and the extent to which human labour is assisted by power. At the present time automation and remote control are being more and more widely introduced and constant advances are being made in the use of cybernetics and electronics. The application of science is becoming a decisive factor in the development of the productive forces of society and the time will come when science itself will be a direct productive force in the fullest sense of the term. But, if this is to be brought about, more and more of the population must be familiarized with the achievements of science and this is possible only if large investments are made in school and adult education. The most advanced technology can produce no results until it has been assimilated by the workers, and the more complex and expensive technical equipment is, the wider the sphere of knowledge without which it is easier to break it than to use it properly, the more important it is to have a wise economic policy with regard to education, and the more fruitful capital investments in this field become.

This has been confirmed by the experience of the U.S.S.R. Pre-revolutionary Russia was notorious for its almost entirely illiterate population. For this reason the new workers' and peasants' government had to begin its cultural work by measures to do away with illiteracy among the population at large. On 26 November 1919, while still involved in the difficult struggle against counter-revolution and foreign intervention, the Soviet Government published a decree concerning the abolition of illiteracy among all adults under 50 years of age. This was achieved within twenty years. As early as 1924, however, the country was confronted with an enormous new task of the same order. A draft ten-year school development plan designed to provide universal free and compulsory education for all children, starting with not less than four years' primary education, was submitted to the State Planning Commission

(Gosplan) for consideration. It was at this time that Gosplan specialists first began to give serious attention to the economic returns from expenditure on school education.

Consideration of the salaries and productivity of different categories of manual and other workers in relation to their educational qualifications, showed conclusively that even the most elementary school education is much more beneficial to a worker than a similar period of practical training at the bench. In making these calculations, we took into account the effects of several factors, such as age, professional experience and technical qualifications. For example, the rudimentary instruction gained in one year of primary education increases a worker's productivity on the average by 30 per cent, whereas the improvements in the qualifications of illiterate workers and the increase in their output, resulting from a similar period of apprenticeship at a factory, is only 12 to 16 per cent a year. The improvement in qualification resulting from one year's education at school is, on the average, 2.6 times greater than that resulting from one year's apprenticeship. After four years' primary education, a worker's output and wages are 79 per cent higher than these of a first-category worker who has had no schooling. After seven years' study (in complete secondary course), an office worker's qualifications may be as much as 235 per cent above the lowest level; after nine years' study (complete secondary course), as much as 280 per cent above; and after thirteen or fourteen years' study (higher education), as much as 320 per cent above.[1]

Highly qualified workers lead to high productivity of labour and increase not only their own earnings but also the social product and, consequently, the national income. The return from education may also be determined by comparing a society's expenditure on school education with the resulting increase in the national income. For example, according to the calculations made in 1924, the sums required to carry out the proposed reform in primary education (to increase the number of children enrolled in schools from 4 to over 8 million in ten years) were estimated at 1,622 million (old) roubles. The increase in the national income resulting from the rise in the productivity of labour of workers educated during those years was already by the end of the period (after only five years' employment), as much as 2,000 million roubles, which more than covered the expenditure. The active life of a worker, between leaving school and retiring, is however, not five but thirty-five to forty years and the greater competency acquired by study at school—the cost of which is broadly offset after the first five years of employment—continues to serve without placing any burden on the budget. According to the same estimate, the enormous rise in the productivity of labour due to primary education will increase the national income, over this period of years, not by 2,000 million but by 69,000 million (old) roubles.[1] Such are the returns from primary education, which is the least expensive to provide.

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[1] Details of these calculations will be found in Stanislav Strumilin, *Problemy okonomiki truda* (Problems of labour economics), published in the U.S.S.R. in 1957 (pp. 155, 156, 175, 178).

The first major objective of the Soviet educational development plan was in fact already practically achieved by the beginning of 1934. Compulsory primary education was provided everywhere and the length of the course had been extended to seven years in the towns. The next object was to introduce secondary education for all. Although progress was temporarily delayed by Hitler's invasion, the work is now well on the way.

The new programme of the Communist Party of the Soviet Union sets forth the following objectives: the introduction of eleven years' compulsory secondary general and polytechnical education, by 1970, for all children of school age in both town and country, and of eight years' education for all young people already employed in the national economy who have not had sufficient education. Between 1970 and 1980 all will have the opportunity of completing a full secondary education. The development of secondary and higher education will continue as new advances are made in science and technology. Those so wishing will be able to pursue higher or specialized secondary education (either full-time or while working in production) in higher technical education establishments or people's universities.

Soviet achievements in the development of the educational system show the following results.

Between 1924 and 1934 alone, enrolments for the shorter primary school course (four years) rose from 8.3 million to 18.3 million, the latter figure covering nearly all children in the appropriate age group. After a considerable falling-off during the war years, the same level was again reached and, by 1960, there were 18.6 million pupils enrolled for the first four years.

The number of older children receiving general and specialized education enrolled in grades V to X in secondary schools, and in technicums, and the number of students attending higher educational establishments, is increasing even more rapidly (see Table 9).

Between 1930 and 1960, the population of the U.S.S.R. increased by 39 per cent and the number of enrolments in educational establishments above the first level increased 7.5 times, or 22 times in comparison with 1914. As a result, the specialized workers most urgently needed for the national economy were rapidly trained. The number of graduates of secondary and higher educational establishments also increased from year to year, as did the number of teachers, doctors, engineers and scholars. Table 10 shows the post-revolutionary growth in this field (within the Soviet Union).

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[1] Ibid., p. 165.

Table 9 *Increase in enrolments within the U.S.S.R. since Tzarist times (in thousands of pupils)*

Type of school	1914	1930[1]	1940	1950	1960
Secondary general (grades V-X)	506	2 042	13 796	14 612	17 392
Specialized secondary	36	587	975	1 298	2 060
Higher educational establishments	112	288	812	1 247	2 396[2]
Total	654	2 917	15 583	17 157	21 848
Percentage	22%	100%	534%	588%	749%

1. 1930 is taken as the base year, representing 100.
2. 2.6 million in 1961 (*Pravda*, 25 October 1961).

Table 10 *Number of graduates (in thousands)*

Type of school	1914	1930	1940	1950	1960
Secondary general	...[1]	48	277	284	1 055
Secondary technical	4.9	61.4	237	314	484
Higher general and technical education establishments	10.7	43.9	126	177	343
Total	...[1]	153.3	640	775	1 882
Percentage		100%	417%	506%	1 223%

1. No data available.

During the early years of the planned reconstruction of Soviet industry, many people thought that technology was the solution to all problems. But the first attempts to get uneducated workers to master technical methods proved so difficult that another slogan had to be adopted: specialized workers provide the solution to all problems. It was for this reason that the training of specialized workers at educational establishments expanded so considerably between 1930 and 1940. The war slowed down this process but the years of peace between 1950 and 1960 saw it continuing and developing once more. Between 1918 and 1960, higher educational establishments alone produced 4,781,000 specialists, and secondary technical schools 7,744,000, making a total of 12,525,000, of whom 6,755,000, or 54 per cent, graduated during the last ten years.[1]

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[1] In 1913, in Tzarist Russia, about 290,000 persons had received a higher or secondary education.

Much was also done to eliminate illiteracy. Between 1920 and 1939, special schools and courses gave training to over 96 million illiterate or semi-literate adults. Furthermore, over a period of only twelve years (from 1924 to 1935), 30.9 million children completed primary school (four-year course) and incomplete secondary school (seven-year course). Table 11 indicates the rate of increase in the number of specialists with higher and secondary education in the U.S.S.R. over the twenty-year period 1939-59.[1]

Table 11 *Rate of increase in the number of specialists with higher and secondary education in the U.S.S.R. (1939-59)*

	1939	1959		Per thousand of the population	
		Number	Percentage increase over 1939	1939	1959
Total for the U.S.S.R. (in thousands)					
Higher education	1 177	3 778	321	6	18
Secondary, general and specialized education:					
Complete secondary (ten years)	2 200	19 544	888	12	94
Incomplete secondary (seven years)	12 489	35 386	283	65	169
Total (secondary education)	14 689	54 930	374	77	263
Total (secondary and higher education)	15 866	58 708	370	83	281
Number of persons having received higher and secondary education (in millions)					
Among the active population:					
Manual workers	3.2	28.4	775	43	316
Intellectual workers	6.7	18.2	272	498	884
Total (active population)	9.9	43.0	435	113	434
Among the rest of the population	6.0	15.7	262	—	—
Number of engineers and agronomists (in thousands)					
Engineers	247	834	338	—	—
Agronomists and zootechnologists	295	477	162	—	—

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[1] *Narodnoe hozjajstvo SSSR v 1960 godu* (The Soviet economy in 1960), pp. 21, 28, 29-36, 38, 39.

In twenty years (1939-59), the population of the U.S.S.R. rose from 190.7 million to 208.8 million, representing an increase of 18.1 million, or 9.5 per cent, while the economically active population rose from 88 to 99 million persons, an increase of 12 per cent. The number of persons having received higher or secondary education increased by 43 million, or 270 per cent, despite the losses due to the war. An even greater increase in this proportion is to be observed among the gainfully employed population (335 per cent): in the case of industrial and collective-farm workers engaged mainly in manual work, the proportion of those with higher and secondary education rose from 4.3 to 31.6 per cent, reaching 53.5 per cent in the case of the metallurgical and metal-working industries, 64 per cent in that of the printing and publishing industries, and still higher percentages for certain other categories of workers.[1]

A supply of highly qualified specialists is of particular importance for economic development. The U.S.S.R. has, for a long time, been the country with the most engineers. At 1 December 1960 the Soviet Union had more than 1,115,000 engineers and over 1,930,000 qualified technicians or more than 3 million engineering and technical specialists. Nevertheless, having no fear of over-production of such specialists, the Soviet educational system trained 120,000 engineers and 220,000 technologists in 1960 alone, and this effort is to be intensified in the future. It may be noted that, in the same year, the United States of America had 525,000 engineers and that, over the past few years, the number of new graduates of engineering schools has been no higher than 38,000 per annum.

Literacy campaigns and the introduction of compulsory general primary education have provided a wide foundation for secondary and higher education. Whereas, in 1940, as many as 62 million of the population (excluding school children) had had less than seven years' schooling, in 1960 the number had fallen to 38 million. Thus the section of the population with a low standard of education is contracting rapidly while the average level of education is rising quickly. In ten years' time, however, when the eleven-year course of secondary education will be generally available, the level will be even higher. Over 20 million workers in the higher age-groups with a low standard of education will have retired by that time and their places will be taken by more than 30 million young people from secondary and higher educational establishments. The majority of manual labourers will not only have had a sound technical training but also hold secondary school-leaving certificates. The annual number of graduates from higher and full secondary educational establishments has more than doubled over the past ten years and at present (1961) it has already reached about 2 million. Having regard to the rise in population and the continuing increase in the graduation rate, the number of Soviet intellectual workers will thus rise to at least 30 million in the next ten years and to 70 to 80 million in the next twenty.

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[1] In addition to the general education facilities available, there are also vocational training schools and courses of further training for persons already in employment. Between 1951 and 1960 alone, 5,649,000 workers completed courses at vocational and technical schools and 50.6 million either trained for new professions or improved their qualifications by studying individually or in groups, while actually engaged in production.

In the Western countries, such a high rate of expansion would be liable to result in a heavy over-supply of workers in all the intellectual professions, an increase in unemployment, and a sharp decline in wages. But in a planned economy there are no such dangers. All Soviet citizens are guaranteed the right to work. They need fear neither unemployment nor a fall in wages. The country's current production plans provide, twenty years ahead, for the increase in the productivity of labour, the shortening of the working day which this will necessitate, and an increase in nominal wages, as well as an improvement in the real standard of living of all workers, made possible by the growth of the national income.

As the public education system expands, the State funds allotted to it are systematically increased. From 1932 to 1960, the proportion of the budget assigned to education rose from 10.6 to 14.1 per cent, the actual amount involved being about twenty-five times as great. Whereas in 1940 the appropriations amounted to 2,250 million roubles, in 1960 they rose to 10,300 million roubles (103,000 million old roubles) or approximately 11,500 million dollars. And, of course, parents pay nothing for their children's education.

In 1960, the unit cost of education (in new roubles) was about 3,000 roubles in the case of the full secondary education course (ten years), and no more than 3,600 roubles for the seven-year course of secondary education followed by training in a technical school, and 8,000 roubles for higher and secondary education combined (fifteen years' study in all), including scholarships. It was naturally lower in the case of the correspondence courses provided by technical schools and higher educational institutions. It will be seen that expenditure on education is relatively low, and the direct economic return from it is thus all the more significant.

This return is reflected first of all in the increase in workers' wages. In 1924-25, the wage level of Soviet workers was still very low, although its real value was no lower than in pre-revolutionary times when the additional social insurance payments are taken into account. Later on the wage level rose greatly, with the increase in the productivity of labour, to which the higher standard of education among the population made a great contribution.

It has already been pointed out that, other things being equal, rudimentary education leads to an increase in wages of 30 per cent, and a full primary education to an increase of nearly 80 per cent. On the basis of these figures, it can be said that by 1934 the elimination of illiteracy alone resulted in an increase of income of approximately 2,400 million roubles per annum for 57.5 million workers. In addition, 23.8 million pupils completed the primary-school course between 1924 and 1935, which represents a combined annual wage increase of approximately 2,650 million roubles. In other words, considering these two categories alone, without taking account of secondary or higher education, the total annual returns from education already exceeded 5,000 million roubles. By 1935, the additional income of the population, in wages and labour benefits as a whole, due to the rise in educational standards was not less than 10 per cent.

Since that time, the wage level and average standard of qualification of Soviet workers have risen to three or four times what they were before. By the time they start work, all young people have had at least four years' education, and many of them have had seven or ten years' secondary or a higher education. Engineers and technicians are, of course, more highly paid than ordinary workers. For each year of study over and above the four years' primary education, a worker's annual salary rises by a given amount. In a single year the increase is not great, but over a period of thirty-five to forty years the total of this additional income represents, in terms of present standards, not less than 12,000 (old) roubles for technicians and 18,000 (old) roubles for engineers—amounts far greater than the total State expenditure on their education.

Every Soviet worker playing a part in the production of material goods not only completely offsets the expenditure on the 'production' of his labour, but also creates a surplus product 'for society' which can be used for social consumption and saving. The improvement of workers' qualifications results not only in higher remuneration for their labour but also in an increase in their 'social' product, which goes into the country's reserves for public consumption and saving. Therefore, in studying the efficiency of school education and the profit-earning capacity on investments in this field, account must also be taken of the portion of the surplus product resulting from improvement in the qualifications of workers.

Between 1940 and 1960, the national income of the U.S.S.R., expressed in constant prices, increased from 33.5 to 146.6 thousand million roubles, representing an increase of 338 per cent or 113,100 million roubles (at 1961 prices), whereas the number of workers taking part in the production of this income rose, over the same period, from 54.6 million to 68.4 million only, or by as little as 25 per cent. But the improvement in the qualifications of the labour force resulting from secondary and higher education has yet to be considered. If we equate a unit of complex labour with a certain number of units of simpler labour, according to the wages scale, i.e., if we consider, for instance, that one worker with a higher education diploma equals two workers who have completed primary school only, the figures given in the above calculation for the number of workers employed in production may be increased by 19 per cent for 1940 and 30 per cent for 1960. Such adjustments, reflecting the enormous expansion of higher and secondary education in the U.S.S.R., substantially change the dynamics of labour upon which the social product and national income depend. In the Western countries, where the standard of education among the workers has not risen so sharply, adjustments of this kind may not be necessary. In the U.S.S.R., however, they are so considerable that to ignore them would be to discount the whole cultural revolution which is taking place.

Another major factor accounting for the increase in the national income is the provision of the labour force with additional means of production, which may be measured approximately in terms of the increase in investment per unit of labour, prices remaining constant.

Between 1940 and 1960 fixed capital for purposes of production in the U.S.S.R. rose from 55,700 to 173,900 million (new) roubles, i.e., it increased more than threefold. If the number of workers remains constant, any increase in such capital is, as a general rule, reflected in a corresponding increase in production due to the introduction of the additional equipment. If, however, there is a simultaneous increase in the quantity of labour and the equipment at its disposal, then the resulting increase in production is proportional to the product of these factors.

Table 12 indicates the degree of importance of each of these factors in the increase in the national income of the U.S.S.R. over the past twenty years. Contrary to Western practice, only that part of the national income derived from primary sources (production of material goods) is considered in this table; the incomes of persons employed in the provision of services, even the most useful and necessary, such as doctors, teachers and other scientific and cultural workers, are not included, since these persons exchange their labour for that of the workers in the production sector so that their entire income is in fact drawn from the same primary source—the production of material goods.

Having thus limited the definition of the national income, in order to avoid counting the same items twice, we have included in the labour force directly contributing to the production of this income only those workers actually engaged in production, thus excluding the considerable numbers of scientific and cultural workers, and members of families engaged in domestic work, who have had a secondary and higher education. Nevertheless, the role of highly qualified labour is clearly very important. True, if the increase in the national income is considered from the consumer aspect, its growth over the past twenty years is seen to be due mainly to the great expansion of fixed capital and technical equipment. The slight 'discrepancies' shown in the table above indicate that

Table 12 *The dynamics of the Soviet economy*

	1940		1950		1960	
	Amount	%	Amount	%	Amount	%
Fixed capital (in thousand millions of roubles)	55.7	100	70.7	127	173.9	312
Labour in the production sector						
Number of workers (in millions)	54.6	100	56.0	103	68.4	125
Adjustment for standard of qualification	10.5	100	14.5	138	20.4	194
Weighted total	65.1	100	70.5	108	88.8	136
Adjustment as a percentage of total (weighted) labour force	16.1	—	20.6	—	23.0	—
National income of the U.S.S.R. (in thousand millions of roubles)						
Due to increase in labour force	33.5	100	36.2	108	45.6	136
Due to the equipment available to labour:						
Due to increase in fixed capital	—	—	9.0	27	71.0	212
Due to the combination of these factors	—	—	3.3	10	25.7	77
Discrepancies	—	—	6.4	19	4.3	13
Total	33.5	100	54.9	164	146.6	438
Total productivity of labour	—	100	—	152	—	322

we have not taken sufficient account of the effect of higher standards of education on the growth of the national income. These 'discrepancies' appear to show in particular that the return from capital investments over the period considered increased slightly more rapidly than did fixed capital itself. With a rise in the productivity of labour, so long as prices remain constant, only the purchasing power of the rouble, dollar or pound varies; there is no change at all in the actual proportions of labour with different types of qualification used. Since, in 1960, the total national income amounted to 146,600 million roubles at current prices, 23 per cent of this sum being due to improvement in the qualifications of the labour force, in monetary value this fraction represents no less than 33,700 million roubles.

Such is the contribution made by secondary and higher education to the national economy in the U.S.S.R. It may be compared with current State expenditure on education, and with capital invested in the building and equipment of every kind of educational, scientific and cultural institution, for schools, theatres, art galleries, zoological gardens and polytechnical museums all play their part in the education of workers and the improvement of their qualifications. According to the Central Statistical Office, such investments amounted to 1,205 million (new) roubles in 1930, 4,370 million in 1940, 5,388 million in 1950 and 16,237 million in 1960, at present values. This expansion is striking, but the rise in productivity due to secondary and higher education has been even more rapid. The comparison in Table 13 between the increase in productivity and the total expenditure on all types of education in the country shows the constantly increasing rate of return. It will be seen that, between 1940 and 1960, fixed capital in the sphere of education, science and the arts increased even more rapidly than in the production sector, and that, in constant prices, current expenditure on education more than trebled. Over the same years, however, the addition to the national income due to higher and secondary education increased more than sixfold, and the net income, after deduction of current expenditure, increased tenfold. The average returns—for the national economy as a whole—from investments in this sector of cultural development has thus broken all known records, increasing from 52 to 144 per cent per annum.

To many, such a return from the public education system may well

Table 13 *Return from, and profit-earning capacity of, the educational system in the U.S.S.R. (in thousand millions of roubles, prices remaining constant)*[1]

	1940		1950		1960	
	Amount	%	Amount	%	Amount	%
Fixed capital in the educational and cultural sector	4.37	100	5.39	123	16.24	372
Return from education:						
Increase in the national income	5.39	100	11.31	210	33.72	626
Current expenditure per annum	3.13	100	4.25	136	10.30	329
Net increase in income	2.26	100	7.06	312	23.42	1036
As percentage of fixed capital	52	—	131	—	144	—

[1] *Narodnoe hozjajstvo SSSR v 1960 godu*, pp. 716, 844; *Narodnoe hozjajstvo SSSR v 1958 godu*, pp. 770, 900 (Statistical yearbooks).

seem surprising, especially as it is not included in any form of official accounting. Not everyone perfectly understands how such a high rate of increase in the national income in the productive sector comes about through the steady expansion of the numbers of workers with increasingly high educational standards.

Lenin, the founder of the Soviet State, showed as early as 1918 that the educational and cultural development of the population was one of the main requisites for raising the productivity of labour. Since then, there has been a real cultural revolution in the U.S.S.R. The educational and cultural development of the whole of the Soviet population has attained a level never previously reached and is continuing energetically. It is not only those directly concerned in the production of goods who play an active part in this development, but also those who 'prepare, mould, develop, preserve or merely maintain the labour force'.[1]

The schoolteacher 'prepares', the professor 'develops', the doctor, to a lesser extent, 'preserves', the labour force of the productive sectors and enterprises. And if we do not take account of their work in calculating the value of the country's material production, it is only in order to avoid counting the same items twice, since the results of their work are already shown in the improvement in the qualifications and the increase in the productivity of the workers directly engaged in the productive sector.

For the same reason, in estimating the national income, we also leave out of account the work of pupils and students engaged in acquiring the knowledge and mastering the methods of thought which they will later apply in productive work. Their numbers, however, are enormous. During the last few years, a total of at least 50 million persons a year, of all ages, have been attending schools and following courses of study. To this number we should add yet another 20 million 'industrial innovators' who vie with each other in discharging their undertaking to 'study, work and live according to the principles of communism', and who devote every free hour and every free minute to study, while continuing to work in production. The All-Union Society of Rationalizers and Inventors now numbers more than 4 million workers engaged in production. In 1960 alone, the amount saved by the application of 2,536,000 innovations proposed by these front-rank workers is estimated at almost 1,500 million roubles. But these inventions represent something more than material advantage to the inventors themselves and savings for the State. Account must also be taken of what this mass movement in which they are taking part means to the Soviet workers.

'It appears to me', writes one of them, 'that the chief advantage of proposals for rationalization is not the savings thereby made in roubles and copecks, increasingly substantial as these are. The greatest value of this system is that it kindles enthusiasm and does away with boredom and indifference. . . . Life is good and one goes cheerfully to work in the knowledge that the challenge of a new idea or a new problem of research is waiting. That is why we in our workshop have set ourselves a completely new aim: every worker must become a rationalizer. Rationalization is an absorbing passion. One has only to think up one idea for a second to present itself. With the third, one is already a different man, longing to study, plunge into books, devour newspapers, living a wonderful adventure.' The individual is awakened to the poetry of creative effort and the enthusiasm for work it engenders gives a new meaning to his entire life.

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[1] Karl Marx, *Teorii pribavochnoj stoimosti* (Theory of surplus value), Part 1, Moscow, 1955, p. 142.

It would be difficult to assess the true value of every aspect of this intellectual work, which combines study with creative work, and is carried on outside production or the working day. But there is no doubt that all these aspects of work—which are continually expanding in the U.S.S.R.—are, at least indirectly, a potent factor in the growth of production and the high rate of increase in the national income, characteristic of the Soviet Union.

Similarly, the part played in this expansion by the most creative work of all—scientific work—cannot be measured directly. The number of scientific workers in the U.S.S.R. is rapidly increasing. Between 1940 and 1960 alone, it rose from 98,000 to 354,000, representing an increase of 360 per cent, and in another twenty years, at the same rate of growth, it will be counted in millions! It should be remembered that there are no industrial or commercial secrets in the U.S.S.R. and that any attempt to monopolize a scientific achievement for private ends is inconceivable. Perhaps it is precisely for this reason that new possibilities are opened up for scientific development in countries where this practice no longer exists.

Science is international. The scientists of all countries, including the U.S.S.R., not only make their contributions to the common store of scientific knowledge, but themselves draw freely on the best of the achievements of world science. And this science, by helping men to master the most powerful forces which nature offers in its bounty, itself becomes a more and more powerful force of the human intellect. The treasures of science accumulated by the creative labour of many generations of researchers, from every age, cost great effort only to those who first discover them, for any discovery of genius can afterwards be easily assimilated by the people at large.

Over thousands of years, millions of great minds, from Euclid to Lobachevsky, from Pythagoras and Archimedes to Newton and Einstein, from Heraclitus and Aristotle to such lucid, logical theorists as Marx and Lenin, have carried science forward by their creative work. And, though these men are now no more, the fruits of their labours will continue to serve mankind for thousands of years to come. But those truths the discovery of which cost Euclid, for example, a whole lifetime of effort, are mastered by our schoolchildren, along with dozens of other subjects, in some three years. They learn Newton's binomial theorem or Mendeleev's periodic classification of the elements in a very short time. But today's schoolchildren are tomorrow's producers. And the comparative ease with which they master all the scientific knowledge that has earlier been acquired at the cost of great effort, makes it possible for us to regard that knowledge as a free gift from nature.

This knowledge has special value only if it is combined with practical work for, under the present conditions of production brought about by the development of automation and electronics, workers have to face new demands. In these circumstances, what really matters in production now is not so much muscular strength and toil-hardened hands, but technology enriched by the knowledge and intelligence of the worker at the machine and on the production line. It is for this very reason that science here becomes a direct productive force, along with the technology and power necessary for production. Moreover, it may be said that the 'efficiency' of science in these conditions increases in proportion to the volume of knowledge applied, multiplied by the degree of its assimilation and the extent to which it has been spread among the workers.

The successes achieved in public education in the U.S.S.R. over recent decades have made it possible, to a great extent, to apply science directly to production and to increase its efficiency as an element in the productive force of labour. But this is largely explained by the fact that Soviet workers, who feel themselves to be not the servants but the masters of production in the U.S.S.R., are themselves extremely anxious to improve their qualifications through study; by tens of millions, they vie with each other in increasing output rates, and nowadays millions of talented inventors and rationalizers emerge every year from the ranks of the workers.

Their successes are explained also by the fact that science has greater credit in the Soviet Union than anywhere else in the world. 'To go forward without science is to walk like a blind man without a guide—one is bound to stumble.' This wise observation is already becoming an integral part of our folk wisdom. 'Science is our compass.' Such is our guiding principle and, as the whole of Soviet experience has shown, it leads to brilliant results.

In the U.S.S.R., the cultural revolution and economic development are closely interlinked. Investment in public education produces very good returns because it serves the cultural interests of the labouring masses themselves and meets the objective requirements of economic development. Thus, in this process, the cultural factor is known more and more clearly to be economically productive and profitable.

Chapter IV

Educational planning

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The growing interest and participation of economists in educational planning is one of the most encouraging recent developments in the field of education, and has attracted the attention of other disciplines to the problems of educational development. More people now insist on an interdisciplinary approach to these problems as the most valid method for dealing with such a vast and complex field.[1] Only a few years ago, educators began to bring together educational administrators and economists, and other specialists. True, the educators' primary concern was to ensure more internal and external funds for education. Nevertheless, the rapprochement has certainly broken the ice for the educational sector; education is now widely accepted as a prerequisite for general growth. It has also made the educators, both in advanced and developing countries, aware of the need to reappraise the general and specific goals and methods of education. However, educators have not yet realized the importance of a better understanding of economic theories and their application to educational problems. For their part, the economists have not properly taken account of a long history of pedagogical research and practice; sometimes they have ignored the cultural and social role of education.

Both groups, however, are now searching for new solutions; mutual problems are being defined, and there is more understanding of the difficulties and limitations. The various other chapters of this manual provide further evidence of the above (particularly Chapter I).

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[1] A first attempt at the international level was made by Unesco and the French National Commission for Unesco; cf. 'Colloque sur la planification de l'éducation dans ses rapports avec le développement économique et social, Paris, 1959', in *Tiers monde*, Paris, Vol. I, Nos. 1-2, Jan.-June 1960, pp. 27-250.

This text is intended not only for those who advise governments on educational planning, but particularly for economists who are interested in educational planning, who are willing to help develop a sound approach to education and training problems.

Nature and scope of educational planning[1]

Educational planning is the frame of reference and the point of departure of the interdisciplinary approach in education. It is also the logical response to the universal trend towards planning over-all development. Planning is an instrument, not a goal or an end in itself. It is an attitude reflecting the desire for orderly change and the strategy by which this change can be brought about. Secretary-General U Thant, in presenting his proposals for the United Nations Development Decade, stated that 'development is not just economic growth: it is growth plus change' and nowhere is this more strikingly illustrated than in the countries of Asia, Africa and Latin America in their search for new solutions to the old problems of poverty, hunger and ignorance.

Educational planning is a cohesive force that co-ordinates and directs the many different components of an education system and ensures that widely accepted long-term goals, such as universal primary education, are approached more objectively. It implies a realistic appraisal of the country's financial means, its human resources and institutional structures, and other factors bearing upon the success of an educational plan.

Educational planning is not a magic formula that will come up with ready-made solutions. It is an instrument to channel all knowledge about education and related disciplines into the preparation and imple-

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1. The nature and scope of educational planning were described by Mr. G. Betancur in his statement to the Second Inter-American Meeting of Ministers of Education (Lima, 1956). A summary of his statement can be found in: G. Betancur-Mejia, 'Significado y alcance del planeamiento educacional', *Educacion* (Havana), XVIII, No. 2, Feb. 1959, pp. 23-29, 34. The Inter-American Seminar on Overall Educational Planning (Washington, 1958) produced a comprehensive definition on the subject which is still valid today (Recommendaciones del Seminario Inter-americano sobre el planeamiento integral de la educacion. Special issue: *La Educacion* (Washington), No. 11, July-Sept. 1958, p. 5). The Twenty-fifth International Conference on Public Education, in recommendation No. 54, also discusses the nature and scope of educational planning (Twenty-fifth International Conference on Public Education, *Planning of Education*, recommendation No. 54. Geneva, Unesco/IBE, 1962).

mentation of long-term and short-term educational development plans.[1] Since it is primarily a tool of development, it can be applied to the most widely varying socio-political environments and adapted to the goals of each country. It involves willingness to size up the situation, to measure the country's capacity to respond to that situation, and to prescribe the action to be taken. Because educational planning necessarily implies a global approach it brings to light shortcomings and needs that hitherto had been ignored or unknown. By placing these in proper perspective, it ensures a balanced distribution of energies and resources both for short-term and long-term action.

In addition, educational planning has the difficult task of ensuring that education fits harmoniously into the pattern of change, that it is sufficiently progressive to produce the kind of social and technical leadership and qualified manpower required, while at the same time preserving the continuity and development of a society's cultural identity. Opinions will differ on which should come first but there can be no disagreement on the need for a harmonious blending and development of both.[2]

Organizational aspects

Educational planning presupposes the existence of administrative and executive machinery. Information must be gathered on past and present situations, problems analysed, and alternative solutions determined. Each level and branch of education must be correlated, educational goals linked to global development plans, interdisciplinary participation (educators, economists, sociologists) ensured and the permanent active support of the general public sought.

While it is true that there are no hard and fast rules for educational planning and that each country must adapt the specific organizational details to its own administrative, political and institutional set-ups, two main administrative units are a prerequisite.

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[1] A 'plan' is defined in this paper to include the over-all objectives of education. A 'programme' is a more detailed determination of specific objectives to be achieved in a specified time schedule. 'Projects' are individual components of programmes.

[2] The need to combine both economic and cultural aspects of educational planning is further stressed by H. S. Parnes when he suggests a twofold approach to the problem of existing educational requirements which he calls 'manpower-requirements approach' and the 'cultural approach' ('Educational Needs for Economic and Social Development', *OECD Mediterranean Regional Project*, paras. 26-27, Paris, 1962). F. F. Hill's statement seems to me also particularly pertinent: 'The traditional values of existing cultures frequently were regarded principally as obstacles to development. The contributions of these factors to the coherence, dignity and independence of societies in the newly independent countries were not sufficiently understood and appreciated. They are now widely recognized.' ('Education and Development: Key Issues for Policy Makers', by F. F. Hill, paper delivered before Third National Conference of the Canadian National Commission for Unesco, held in Ottawa, March 1963).

First, a unit at the interministerial level, preferably as part of the national authority in charge of economic and social development planning which is to determine the needs for qualified personnel and to coordinate the efforts to supply them (cf. Chapter VI). The educational sector must be represented on the development authority where policy and budgetary decisions are taken. Ministries of education must have a preponderant role since they are not only major employers of qualified personnel in terms of administrators and teachers but also because they are the main source of people with enough education to profit by the training for the various global development programmes and projects.

The second essential unit is the educational planning authority itself at the Ministry of Education. This unit is to plan the educational system, including all educational levels and branches as well as adult education. A close relationship must be maintained with the development authority and its manpower unit, so as to correlate the country's broad goals to its financial capacity and manpower resources and requirements. The educational planning office, in turn, will provide information in regard to the manpower requirements of the educational sector and its ability to meet the demand for education by the various other sectors.

Many countries have established educational planning offices[1] and are now beginning to create human resources development boards; but technical assistance in this field is still high on the list of requests from developing countries. The organization of educational planning units is usually difficult. This is due to the lack of trained and qualified personnel and also to the mistrust with which the planning unit is regarded by educational administrators who have been embedded for years in the administrative structure and are rarely capable of raising their sight from the day-to-day routine; they fear and resist innovation which they interpret as a threat to their pre-eminence and authority. In contrast the sound educational planner must travel light; he carries but one basic premise: the pedagogically sound and productive expansion of education—and he must help to find different solutions for each problem; he must not be afraid of departing radically from cherished traditions or ridding the administrative superstructure of dead-wood—whether in terms of personnel or procedures. It is therefore perhaps less difficult to get an educational planning office off the ground in the newly independent countries which are starting their educational systems from scratch and which do not have the institutional handicaps and pressure groups that exist in other developing countries.

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[1] A list of countries currently embarked on educational planning can be found in: Unesco, 'Educational Planning; a Preliminary Listing', *Education Abstracts*, Vol. XIV, No. 2, Paris, 1962. A case study is contained in: R. Diez-Hochleitner, 'Une expérience pilote en Colombie: la planification intégrale de l'éducation depuis 1956', *Développement et civilisations* (Paris, IRFED), No. 5, Jan. 1961, pp. 67-76.

It is essential that advisers on educational planning recognize that planning is an inseparable component of modern administration. This does not mean that educational planning must be superimposed on or supplant normal administrative machinery. On the contrary, educational administrators must be actively involved in planning; they must follow it step by step, because they are the ones who will have to supervise its implementation. Educational planning units can be effective only if they are assured of the co-operation of sound school administration; this means a constant two-way exchange of information that will permeate the entire educational structure of a country.

Education and training: problems of expansion and improvement

The following reviews some of the more evident and common problems of the developing countries, although they are by no means confined to these countries.

Generally, the problems include: preferential attention to extending primary education without a proportionate effort to raise its productivity in terms of the number of students who complete the primary cycle (related problems: pupil drop-outs, repeaters and absenteeism, women's education, age of admission and of leaving) or to improve the quality of education (related problems: pre-service and in-service training of teachers, salaries and other incentives for members of the teaching profession, length of courses, textbooks, modern teaching methods and teaching aids). As a result, most of the figures on primary school enrolment are largely fictitious.

From the economic point of view, the investments in pupils who drop out of school after the first or second year are substantially wasted. Therefore, one of the most urgent tasks for educational planners is to increase the holding power of schools. The economic return after the second school year, in principle, increases in proportion to the number of primary-school years completed within a scale that educators insist should be a minimum of six years, depending of course on the quality of the education provided.

From the sociological point of view, many of these countries still maintain a double educational standard that discriminates against the rural populations. There are, in effect, two educational systems: the urban primary schools that offer the full primary education cycle, have more and better-trained teachers, and generally receive preferential treatment in regard to textbooks, equipment, and buildings; and the rural primary schools that offer two, three, and at the most four years of the primary cycle, that are often ill-housed, badly located, taught by novices who do not remain long in rural schools, and that have practically no textbooks, teaching aids or equipment.

Flexibility in planning for rural primary schools is particularly commendable since it is an area where local initiative is highly desirable and badly needed.

In spite of the fact that most governments have endorsed the principle of universal, free and compulsory primary education, many developing countries cannot afford to continue giving it absolute priority over all other types of education. This question of balance is of great importance in educational planning, and will be discussed later on. The developing countries should limit the expansion of primary education at least to the rate at which teachers can be properly trained and adequate facilities provided. Nevertheless, some waste is unavoidable in the period of transition and rapid growth typical of these countries. Educational and general development goals should be reviewed and adjusted to keep this waste to a minimum.

Most of the problems found at the primary level are also found at the secondary level. Generally speaking, of the very low percentage of pupils who complete primary education, an even lower percentage have the opportunity to enrol in secondary schools, particularly in the newly independent countries. This seriously obstructs the educational process. No single country, even those that make the greatest effort, can claim to have produced enough secondary school graduates for all the middle-level skilled occupations in the various sectors of the economy. Vocational training schools as a whole badly need help to relate their programmes more closely to anticipated job opportunities and also to gain prestige. Nevertheless, the most important, the most urgent task in these countries is to diversify secondary-level education in terms of distribution of enrolment by branches and in terms of adjusting the curriculum to the present and future manpower needs. At the same time, secondary education should impart adaptability more than training for specific jobs. At a recent policy conference[1] it was recognized that 'because of the difficulties and risks involved in making long-term forecasts of the structure of the active population, and the frequent changes in techniques and consequently in manpower requirements, programmes for technical education should be as flexible as possible and should be based on a wide general education. This will facilitate the necessary periodical revision of professional and vocational education'.

Although higher education has many of the problems mentioned in connexion with primary and secondary-level education, it enjoys the advantage of a tradition that reaches back to the Middle Ages when the universities were the focal point of the educational system. Moreover, universities often possess a degree of autonomy even though in many cases they receive government funds. Therefore, it has sometimes proved difficult to correlate—in terms of administration—the higher education services within the educational system. But there is a growing awareness of the need for planning higher education also in the context of educational planning.

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[1] *Policy Conference on Economic Growth and Investment in Education, Washington, October 1961*, OECD, Vol. I, p. 13, 'The Planning of Education'.

Here again a common problem is distribution of enrolment in the various university faculties in terms of the immediate and long-term needs of the country for leadership and knowledge to organize the development programmes of the various sectors. Science and technology and research are badly neglected in developing countries. But at the root of most of these problems lies the great need for full-time professors both for teaching and research activities.

Adult education, often overlooked, falls into three distinct categories: (a) the type offered in the more advanced countries and which is generally provided through university extension courses, including postgraduate work; (b) adult education devoted to training and retraining for new skills according to changes in technology and in occupational market demands; and (c) adult education for illiterate adults or those of low educational levels who are to be absorbed into the economically active population by community development programmes, literacy programmes, training schemes and other socio-economic programmes such as co-operatives, rural-industrial estates, etc. This third type of adult education is of direct concern to developing countries and calls for a comprehensive approach. Pure literacy campaigns do little more than engender or aggravate social and individual frustrations; they do not supply the vital needs of adults whose illiteracy is rooted in socio-economic causes and who very rightly seek first to improve their living standards. Isolated literacy campaigns in the long run produce a large percentage of functional illiterates. Appropriate kinds of adult education enrich the lives of the individuals concerned and contribute towards making them more effective citizens in a changing society. However, economic considerations are of primary importance in adult education for developing countries. To divert funds from the national budget to finance adult education can be justified to the extent that the adults trained can be assured a better job and thereby contribute to the country's gross national product. Illiterate adults are a source of grave social tensions if their hopes are raised and then left unfulfilled by 'quickie' literacy campaigns that teach them nothing more than the bare essentials of reading and writing and rarely provide a follow-up programme for the newly literate to continue advancing his knowledge and skills.

To summarize, the major role of the educational planner is to study the situation and problems of education and training in the light of demographic, economic and social factors, including those of levels and branches of education, providing at the same time for a continuous improvement in educational standards and increasing the number of students graduating from each level. Accomplishment of this most difficult and complex task represents the best contribution that education can make to economic and social development. It should also be pointed out that there is no conflict, necessarily, between qualitative and quantitative expansion—between primary versus secondary education, or between secondary versus higher education. The educational process is an organic whole that must respond quickly to the continual adjustments called for by changing circumstances.

Specialists called upon to advise on educational plans will logically tend to establish priorities. But priorities in education—as in any other sector—should not be absolute and mutually exclusive. They should represent a series of interlocking actions each of which will affect the others. In defining priorities, care must be taken to spell out the quantitative implications so as to ensure that they are within the capacity of the country's resources. Among the priorities that can be established *prima facie*, in practically every circumstance, are the following:

1. Need for establishing and reinforcing the machinery for planning of education including educational statistics, and for manpower studies, in order to make the best use of the resources available.
2. Improvement of the administrative structure, including personnel and procedures, to allow the effective implementation of programmes and projects.
3. Training of teachers, professors, supervisors and administrators, who are the body and soul of any educational system.
4. Pedagogical research to ensure that policies resulting from planning are based on realistic and specific solutions that respond to the idiosyncrasies, the cultural heritage and long-term aspirations and goals of the country.
5. Modern teaching methods and teaching aids, which determine the effectiveness and impact of the human resources devoted to the great venture of education and training, and which greatly influence the cost and the multiplier effect of the educational institutions.
6. School construction and equipment, not simply to provide an educational 'roof' but as an essential element in producing the atmosphere conducive to the efficient use of the school plant.

Administration and finance

Education, embracing both public and private institutions and facilities, is one of the largest sectors of national life. Huge sums are involved; in addition to the regular education budget, funds and other services are provided by other ministries, provincial, state and local authorities and private sectors—even so, they are frequently not enough to cope with the most urgent needs. Educational services absorb the largest proportion of civil servants. Furthermore, education is concerned with the whole population, although more directly with children of school age, who represent an average of one-fourth of the total population. Educational institutions are supposed to mould individuals and through them the values and attitudes of the societies in which they live. In other words, it is perfectly valid to say that education is one of the main enterprises—if not the most important—of any nation.

However, the sad fact is that education and training do not always employ or attract the most qualified leaders, administrators or specialized personnel. Ministries of education are all too often given to petty politics and intrigues and have little awareness of or concern with the potential economic value of the vast sums at their disposal. It is therefore essential for those advising governments on educational planning, as it is for those directly involved in planning, to review the administrative structure and bring some order into its activities before embarking on the planning operation.[1] It is also essential to ensure that suitable personnel are placed in charge of the plan's execution and that modern administrative procedures are established. Once the plan is adopted a further review of administrative problems is needed to make the administrative machinery adequate to the goals of the plan.

It is essential to introduce the programme and budget technique into educational administration. This technique calls for financial justification of the various programmes and projects, and is an effective tool for avoiding the formulation of so-called 'plans' which are little more than a list of idealistic goals that more often than not are unrealistic.

Financial management of education budgets still leaves much to be desired in the developing countries. Capital investments and recurrent expenditures have to be analysed not only from the educational point of view but also from that of economic returns. The project approach (cf. Chapter XI) is an essential feature of sound financial policies and should conform to the most advanced practices followed by other sectors. Because of the lack of experience in this field and the lack of continuity of

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1. 'La Programacion Administrativa', R. Diez-Hochleitner, *Documentacion Administrativa,* Madrid, Vol. 72, 1959.

the educational administrative machinery, such basic tools as statistics and cost analyses are still undeveloped.

A new dimension has been added to the financing of education with the increasing international financial sources such as the United Nations Special Fund, the International Bank for Reconstruction and Development and its affiliate the International Development Association and, at the regional level, the Inter-American Development Bank. Added to these are many bilateral aid programmes, and last but not least are the private foundations such as Ford, Rockefeller, Carnegie and Nuffield.

The lack of well-devised projects is more and more evident, and educational planning is being considerably strengthened by these agencies which increasingly are making it a pre-condition for the beneficiary countries to produce viable plans, with adequate justification. The developing countries have to realize that the expansion or improvement they are seeking calls for initial capital outlays; they must realize that it also implies—after a few years and over a long period of time—very heavy recurrent expenditures to ensure efficient operation of new facilities—a burden which generally has to be borne by the national budget itself.

The planning process

Before the actual work of drawing up an educational plan begins, the administrative machinery referred to earlier must, of course, be in operational condition. It is not my intention to detail the various aspects and steps to be followed in drawing up a plan, but simply to indicate certain basic elements which are constant factors in the planning process.[1]

The point of departure for educational planners must be the past history and present reality of the country's education and training services and related factors. The first step, therefore, will be to survey the educational situation and needs. This calls for well-organized statistical services to provide essential and reliable data (cf. Chapters VIII and X). This effort alone would justify the creation of educational planning machinery, because in the process of establishing the educational situation and needs, corresponding solutions present themselves. Once the extent and nature of the action required is known, an atmosphere of confidence is created that filters through the country's policy-making bodies. Realistic diagnosis of a problem and of the resources available to deal with it usually stimulates action by all concerned. In more than one case, this process has produced additional financial support because it has created an awareness of the urgency and dramatic proportions of the problem. The survey should be as comprehensive as possible and cover both qualitative and quantitative aspects, as well as financing and administration. Once it is completed, the next step is to establish priorities and possible alternative solutions to allow for changing circumstances and resources.

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[1] More detailed information can be found in *Elements of Educational Planning* (Educational Studies and Documents series, No. 45), Unesco, Paris, 1963. For information on a specific case, see Vol. I, Chapter 2.23 (5), 'Methodology of Planning', of the *Informe del Projecto Para el Primer Plan Quinquenal*, Bogota, Ministerio de Educacion Nacional, Oficina de Planeamiento, 1957, 5 vols. processed. See also 'Mechanics of Planning', a working paper presented to the Inter-American Seminar on Over-all Educational Planning, 1958, Unesco/OAS, *Documentos de trabajo*, Washington, D.C., Union Panamericana, 1959, 5 vols.

Particular attention must be given to costing and financing, the human resources potential for education and the country's over-all needs for qualified manpower.

The results of manpower studies should be taken into account particularly for the following purposes: (a) to establish the order of magnitude and distribution among the various types of secondary and vocational schools; (b) to establish the order of magnitude and distribution among the various types of higher education institutions; (c) to programme adult education activities to supply the short-term needs of the various sectors of the economy.

Due recognition must be given to the symbiosis between the educational pyramid and the economically active population. The Correa-Tinbergen model (cf. Chapter IX) can provide the general review and the interrelationship between the educational system, the labour force and a desired economic growth rate.

Many educational planners have experienced difficulties at the point of formal adoption of the plan. It is precisely at this juncture that the weight of public opinion can and should be brought to bear. Public opinion is an intangible but important element that educational planners must take into account and every effort should be made to awaken public interest and support of the nation's educational goals.

A plan that is to succeed in a democratic society needs to be understood not only by those who will participate directly but also by those who are to benefit from it. Every step of the plan's development should be accompanied by a campaign explaining its aims so that each sector of the public is identified with the goals and recognizes its civic responsibility to contribute to the success of the plan.

The case for permanent educational planning machinery cannot be put too strongly. The educational process does not end the moment the plan is adopted. On the contrary, the authors of the plan must closely watch its execution. Educational planners must be on hand and directly involved in the periodic evaluation of the various phases and parts of the plan, for two major reasons: first of all, because planning calls for periodic adjustment to new circumstances, and only the day-to-day experience can establish feasible and realistic solutions; second, because planning involves a constant search for new and better techniques[1] for subsequent plans that must be drafted in the light of the results of the preceding plan.

These, then, are the basic steps in planning education and training programmes. Let me also reiterate the importance of ensuring an intimate working relationship with the economic and social development planning machinery.

Regional planning

The idea of educational planning was first advanced and recommended in 1956 at the regional level on the occasion of the Second Inter-American Meeting of Ministers of Education in Lima. It subsequently established national goals in Latin America, but more recently a series of regional conferences[2] has been establishing short and long-term regional goals, both quantitative and qualitative, that are providing a broader frame of reference for the development of education and training. These goals also guide educational planners in a first attempt to underscore the magnitude of the enterprise by placing it within the regional context and thus make governments and leaders more aware of their countries' responsibilities and limitations.

Guidance on the general concepts and techniques of educational planning is also being provided at the regional and international level: for example, the Inter-American Seminar on Educational Planning, Washington 1958 (see footnote 1, p. 86), the International Symposium on Educational Planning, Paris 1959 (see footnote 1, p. 85) and the OECD Policy Conference, Washington 1961 (see footnote 1, p. 90).

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[1] For an introduction to operational research into educational planning see: 'Use of Comparative Education in Planning of Education', by R. Diez-Hochleitner in *International Review of Education, Thoughts on Comparative Education*, 1959.

[2] In chronological order: (a) Regional Meeting of Representatives of Asian Member States on Primary and Compulsory Education, Karachi, December 1959-60; (b) Conference of Representatives of Ministries of Education of Arab Member States of Unesco on the Needs of Educational Development, Beirut, February 1960; (c) Conference of African States on the Development of Education in Africa, Addis Ababa, May 1961; (d) Conference of the Inter-American Economic and Social Council at the Ministerial Level (Ten-Year Educational Program, Alliance for Progress), Punta del Este, August 1961; (e) Policy Conference on Economic Growth and Investment in Education, Washington, October 1961; (f) Conference of African Ministers of Education, Paris, March 1962; (g) Conference on Education and Economic and Social Development in Latin America, Santiago, March 1962; (h) Meeting of Ministers of Education of Asian Member States, Tokyo, April 1962; (i) Conference of African Ministers of Education (Ivory Coast), April 1964.

In Latin America, a first attempt and interesting experience in regional planning was undertaken by the OAS Education Task Force,[1] established to work out in more detail the broad and ambitious goals of the Ten-Year Education Programme adopted in 1961 (Punta del Este Charter, resolution A.1). Its report was presented to the Third Inter-American Meeting of Ministers of Education in August 1963, for the guidance of each of the countries involved, because each will have to make its own plans according to its specific needs and means.

Research and training

Various regional training centres have been established during the past few years such as the ones in New Delhi, Beirut and Santiago, and an International Institute for Educational Planning in Paris is being sponsored by several international organizations to promote research and to harmonize international training activities. Several courses have been held[2] and various national institutions are already doing promising work in this field. Those responsible for training educational planners and for research into the techniques and problems of educational planning should be careful not to let their thinking and knowledge become stale or to regard the theories and techniques of planning as being established once and for all. There is still a long way to go in this new field that overnight has become the 'vedette' in educational circles and in which so much hope has been placed by governments and educational leaders all over the world.[3] A reservoir of knowledge has to be built up, more sophisticated techniques elaborated, and those responsible must keep abreast of developments in economic planning.

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[1] Final Report of the OAS Task Force on Education. *Perspectivas del desarrollo de la educacion en America Latina*, Washington, 1963.

[2] Organization of American States, 'Curso de Bogota sobre planeamiento de la educacion', *La Educacion* (Washington), No. 17, pp. 3-63; 72-85. Spain-Unesco, *La Educacion y el desarrollo economico-social. Planeamiento integral de la educacion. Objetivos de Espana para 1970. Curso-coloquio*, Madrid, Ministerio de Educacion Nacional, 1962.

[3] 'I believe that it is in this task of planning the future—perhaps more than in operational activities, however necessary they may be—that lies the principal and immediate vocation of [international] organizations and, certainly, of Unesco'—R. Maheu, inaugural address to the Conference on Education and Economic and Social Development in Latin America, Santiago, Chile, March 1962.

Chapter V

Social factors in education plans

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Until recently, there were no national education plans to speak of, but only education legislation and programmes. Education policy was scarcely in evidence, and aimed primarily at providing elementary instruction for the working classes and more advanced instruction for the ruling classes.

Since secondary education, and—*a fortiori*—higher education concerned only a small proportion of the children (the more well-to-do, in general) and the link between education and professional life was barely established, at least from a community standpoint, the concept of national planning had little point.

Today, the general provison of education, and its tie-up with economic life, brings forward the problem in an entirely different way.

Whether or not countries have a rational economic development plan, there is an increasingly compelling need for an education policy which in addition to its traditional aims has to provide education, in suitable proportions, for men and women, capable of meeting the needs of a society in process of constant technical change.

Let us first consider the demographic factors, from the purely quantitative standpoint, and then turn to the social factors.

The demographic factors

It is only during quite recent years that the close connexion between education plans and population trends became apparent.

Pupils belong to rising generations and teachers to adult ones; and any demographic disturbance may well modify the age-compositon of the population, and especially the ratio between young people and adults.

Contrary to a very widely held view, the increased expectation of life or lower mortality rate has not so far produced any marked change in age-composition, for it has been increasing the number of young people in at least as high a proportion as the number of old ones.

On the other hand, the fall in the birth rate has indeed produced a profound change in age-composition, since lower fertility has the effect, by definition, of reducing the proportion of children to adults.

In most cases these two trends had hitherto proceeded in step, although with a more or less marked lag between them, with the mortality rate being the first to fall.

This progressive senescence made it easier to recruit teachers and, for the same standard of education, slightly reduced the ratio between educational expenditure and the national income, with the result that the relationship between demographic development and education policy was obscured.

Conversely, the rapid growth of population in many countries, the recovery in the birth rate in the developed countries, and the democratization or progressive extension of education at the various levels has made this relationship very apparent during the past few years.

The following numerical example, which corresponds fairly closely to actual situations, will make this point clear.

A numerical example

The model in this case is one which has been deliberately simplified. Let us assume that there are two populations A and B, which are stationary to begin with:

A which is developed, and hence aged, has a low mortality rate (expectation of life at birth 70 years) and a low birth rate;

B which is undeveloped, and hence young, has a high mortality rate (expectation of life at birth 40 years) and a high birth rate.

Education is assumed to be compulsory among these two populations for a period of eight years (age 6 to 14), with the teachers beginning to teach at age 20 and finishing their careers at age 65.

The initial situation, as regards the data with which we are concerned, is shown in Table 14.

Of the two populations, it is the less developed which has the heavier burden, on account of its age pyramid. With equal standards (number of pupils per class), therefore, it has to recruit a higher proportion of teachers in each twenty-year generation.

As to the annual rate of renewal of teachers, it depends not on school

Table 14 *Relationship between demographic development and education policy*

	A (developed population)	B (undeveloped population)
Population age 20-65	100 000	100 000
Children aged 6	2 410	3 200
School population	19 200	23 900
Young people aged 20	2 380	2 930
Rate of annual renewal of teaching staff	2.38%	2.93%

standards but solely on the ratio between the number of under 20's and the adult population aged between 20 and 65.

Let us now assume that this initial situation is abruptly changed by an increase in each generation of children of 10 per cent in the number of children attending school. The above proportions will then be greatly modified: during the course of eight years, the school population will increase by slightly over 1.25 per cent a year (we take the figure of 1.25 per cent, leaving out of account the very low mortality rate at that age). For the number of teachers to increase in the same proportion (to ensure the maintenance of standards), the annual renewal rate will have to increase from 2.38 to 3.63 per cent for population A, and from 2.93 to 4.18 per cent for population B, or an increase of 52 and 43 per cent respectively.

These very high figures give an idea of the acuteness of the change, for it entails an increase of some 50 per cent in the annual level of recruitment. However, the government has six years before it in which to prepare that change, at least if it is a question of a rising birth rate, for birth statistics are a very sure indicator.

Again, of the two populations, it is the less developed one whose position is the more difficult, for an increase in the number of enrollable children may be due not only to a higher birth rate consequent on better health conditions but also, and especially, to a reduction in the mortality rate, and even more to an extension of school coverage. If, for example, infantile and juvenile mortality falls to such an extent that expectation of life increases from 40 to 50 years, the number of 6-year-old children in a generation identical at birth increases by more than 11 per cent on that account alone, without the number of adults increasing initially in the same proportion. The increase in school enrolment may be larger still.

Population surges and forecasts

The problems which may arise where the population is steadily increasing and school enrolment growing can be readily imagined. The number of teachers to be found is very high; yet the adult generations have not themselves been trained in anticipation of this event. We are faced with a real case of 'reverse genetics'.

These upward surges may one day be matched by surges in the opposite direction. A very high rate of teacher-training, necessary during an acute crisis, may become excessive once the crisis has been met, especially if school enrolment at a higher level removes pupils from elementary schools.

The extent of the possible surges in one direction or another can easily be shown by calculation. If this question has been given very little attention for so long, it is because school enrolment was a matter which mainly affected the Western countries, and that the number of pupils was falling slightly, at least in relative figures, as a result of the fall in the birth rate, with school enrolment moving in the opposite direction. Today, however, the two factors no longer offset each other, but combine.

This survey indicates the necessity of making fairly exact calculations well in advance so as to take account of the tendency for the number of teachers to remain stationary, and to anticipate surges in order the better to ride them out.

Fortunately, the increasingly widespread practice of making population forecasts makes it possible to calculate several years ahead, on the national scale, the number of pupils covered by compulsory education and the number of teachers in certain hypothetical cases. Although local contingencies consequent on internal migration remain, school building plans can be drawn up with some assurance, and an unexpected increase in the number of pupils can no longer qualify as an excuse.

In the case of the construction of new school buildings, practically the only obstacles that might occur are financial; but it is otherwise when it comes to teacher training, for almost all the prospective teachers receive their training for teaching and vocational direction before the birth of the children who will be placed under their care.

In any case, as far as they are concerned, measures should be taken immediately a spurt in the birth rate, a fall in the mortality rate or an increase in school enrolment begins to take shape.

What has so far been said applies to compulsory elementary education. At other levels, the proportion of children of each generation is usually small, so that school enrolment (percentage of children of a generation enrolled at that level) plays an essential part.

It is nevertheless possible to work out forecasts, supplementing demographic estimates by those for enrolment rate. In this way, calculations can be made of the total number of children enrolled at each age, as a source of useful data on the number of teachers to be provided (the same difficulties then arising as were mentioned above).

Social factors

Education and social life impinge on each other in various ways: (a) the former is affected by the latter by reason of inequality in the social status of the children; (b) the former affects the latter by giving young people an education which, directly or not, will to a greater or lesser extent determine their professional activity.

This would imply that there are two separate aspects that could be distinguished. In point of fact, the present study will dwell on three essential problems: (a) social inequality in respect of education, and means of attenuating it (democratization); (b) relationship between education and employment; (c) effect of the educational system on the stratification of social classes.

Inequality in respect of education

Education at the beginning was essentially a class education; and in many countries it is still influenced by the historic process concerned. But in all countries, in any case, the influence of the family is a considerable factor.

In undeveloped countries, this family influence operates intensively through the effect of the economic level. Secondary and higher education, even when they are free, involve expenditure and reductions in income which a family in modest circumstances cannot sustain.

This economic handicap is reinforced by a social one, which is often not apparent but which becomes very clearly so where the population is more developed. It is therefore a point to be stressed.

The child with a high social status is better fed, better housed and better equipped, and this by itself puts him in a better position as far as his future development is concerned, Furthermore, he has early access to picture books and toys conducive to that development; and lastly—and undoubtedly most important—there is the family conversation and the environment which condition the child. In other words, a certain transmission of knowledge takes place in a non-hereditary manner and as a result of purely environmental phenomena.

It is not surprising, under these conditions, to find that the children of well-to-do parents get better marks on average, both in the tests made in the course of special surveys and in the teachers' regular notations.

To give an example, the mental level of the children examined during the major French survey of 1944 was found to be represented at age 11 by marks ranging from 120.6 for the children of farmers to 129.3 for the children of town workers and 146.2 for the children of parents in the intellectual or liberal professions. The class marks given by teachers also reflect substantial differences.

Furthermore, even where the marks, and hence successful performances at school, are on a par, the transition from one level of education to a higher one is also affected by social inequality.

Then there is the further point that handicaps resulting from social status are often accompanied by geographical handicaps (remoteness from towns equipped with suitable schools) and those resulting from the size of the family.

A clear distinction must therefore be made between obstacles due to differences in income and those due to social environment. Even in the Soviet Union, after forty years of suppression of the class system, a certain reserve on the part of workers' families towards higher education is still in evidence. Hence it is wrong to think that absolute equality in respect of education can be achieved by purely economic means (free education or contraction of the range of incomes). More has to be done than that.

The question of whether inequality of family origin (so strongly marked at age 10 or 11) diminishes with time, and, if so, to what extent, is still a matter of dispute. It would be reasonable to think, *a prori*, that this handicap is progressively reduced as the child grows older, in line with the weakening of family influence. But sometimes an attitude becomes ingrained and the damage is irreparable. Furthermore, account must be taken not only of the mental level of the parents but also of their more or less powerful urge to see their children rise in the social scale. In a teacher's family, for example, there is a greater tendency to push the children than in a businessman's family which includes only one child and is certain of providing him with a place in society. There may be other situations, however, which are more complex.

There is a vital need for detailed studies on this point: on the findings may depend, in fact, the question of the duration of the common instruction provided for all children.

Attention is specially focused on very talented children. Where they are not provided with the instruction suited to the development and use of their talents, the disadvantages are twofold: loss to the community as well as social injustice. For these reasons, and for others also, talented children in modest circumstances do not accede to the various levels in the proportion commensurate with their merit, but often break off their studies prematurely in order to contribute their wages or labour to their family. Here again, it is the economic factor—i.e., the family income—which operates. The allocation of study scholarships offsetting the prospective wage is obviously the most appropriate method to apply in this case.

The social handicap is more difficult to correct. It may even be argued that it will not be possible, so long as the family continues to exist as a cell of society, to eliminate completely the differences between children resulting from inequality in their parents' conditions. In all countries, assuming equality of talent, the son of a doctor, teacher or factory director has more chance of acceding to higher education and later to a high social position than the son of a peasant or worker. Often this phenomenon—whose existence no one can dispute—is given too little or no weight. However, it is only by becoming fully acquainted with it, in its inmost mechanism, that it will be possible to combat it most effectively.

Throughout the world a trend can be noted, at least as far as avowed intentions are concerned, towards the democratization of education. But unless a close study is made of the mechanism in question, these intentions are likely to remain sterile.

Relationship between education and employment

Although the idea of rising individually in society thanks to education is one which men have long harboured, it is only at a much more recent stage that the collective relationship between the active population and education has been made the subject of study; and it is still a long way from being properly understood, let alone being properly used.

All too often, a certain lack of interest in the practical application of particular types of instruction is still in evidence in university circles: (a) there is often little concern for developing the spirit of initiative and enterprise which is so essential in modern society; (b) furthermore, although vocational guidance is more and more concentrated on seeing that the best use is made of the child's aptitudes, it takes insufficient account of the extent to which young people need to be trained in order to meet the economic needs of society.

Even in the countries with planned economies, the universities' link with the plan is not always perfect. The latter, in any case, is usually drawn up for only five years or so, whereas a man trained in a certain way is supposed to apply what he has been taught for a matter of forty or fifty years.

We are thus faced with the following problem: every year, the school—in its broadest sense—discharges, as it were, a flow of men to join the active population but without liaison between the two sectors having been properly ensured.

Let us now examine some aspects of this liaison.

Full employment and economic expansion

A shortage of qualified men, at least in certain sectors, exists in all countries, without exception. This is not to be wondered at: technology is constantly advancing, creating sudden new requirements which, even if all the appropriate measures were adopted, would take some years to meet. New discoveries, by definition, fall largely outside the scope of planning and even of rational forecasting.

Where the shortage of qualified men is fairly strongly marked, this structural imbalance, this disproportion, dooms part of the unskilled active population to unemployment—a phenomenon which is particularly noticeable in the underdeveloped countries. Economists increasingly recognize that financial aid to these countries—assistance in the form of capital—is not the essential remedy, and that it cannot be fully effective unless the country concerned has sufficient trained men possessing various skills and especially technical skills.

It may be asked why the primary importance of training men was not recognized earlier, and why it is still underestimated. The reason is that the human factor lends itself less readily to bookkeeping practices; having no market value, human beings do not feature in accounts. The idea of man's value only emerges when he is transferred by contract, as happens in the case of certain professional sportsmen. Champions or star players, i.e., persons who are highly qualified (and sometimes even trainers, for whom the question of profitable publicity does not arise) are transferred at very high fees.

Many other less direct proofs or convergent presumptions could be cited in support of this argument.

It can justifiably be held, without abandoning a strictly materialist standpoint, that the education of men is the most profitable investment —provided, of course, that it is in the right direction.

The shortage of qualified persons and, more generally speaking, the imbalance among the active population, are not peculiar to underdeveloped countries. It is also found, for more than one speciality, in the developed countries, or at least in those without planned economies.

The experience of the past few years

During the period 1950 to 1960, potential employment forecasts were largely exceeded in a number of countries—in particular, the Federal Republic of Germany, Austria, Netherlands, Italy and Switzerland, and also Japan. The really outstanding successes of these countries can be explained only by the existence of a considerable, although of course inadequate, proportion of educated and qualified persons.

In Western Germany, for example, 7 million persons of active age have entered the territory since the Potsdam agreements. They came without capital, i.e., without factories, houses, hospitals or universities, but with their knowledge. Had they been 7 million uneducated labourers, the German economy would not have expanded as it did, and there would have been a great mass of unemployed.

The question being one of proportionality among the active population workers benefit from a high general level of intellectual education, provided they are not too numerous. For example, a charwoman in Western Europe earns more than a worker in an underdeveloped country and many times more than she would have earned in that country for similar work. The same phenomenon can be seen in the case of other unskilled professions: the baggage porter or dishwasher earns far more in a developed country than his counterpart in an underdeveloped country. Hence education and training enrich all the members of a community.

This essential role of human education explains the reversal of the age-old flow of immigration which has now been in evidence for half a century, and especially during the past few years.

Switzerland, for instance, with its lack of natural resources, has long been a country of emigration. Latterly a particular effort has been made to develop education and technical training there. Thanks to the progress made, the number of jobs has grown to such an extent during the past few years that considerable recourse to immigration has been found necessary: the number of foreign workers now amounts to 20 per cent of the active population—a substantial proportion which has outstripped the most generous forecasts.

As stated above, the earnings of an unskilled worker performing a particular type of work differ considerably according to whether he works in a developed or an undeveloped country. But for the fact that there are many sociological or political obstacles in the way of migration, there would be intensive immigration to the developed countries—an eventuality which all these countries have guarded against by introducing protective measures.

A qualitative forecast

Let us now see how a more effective link could be established between education, which produces men, and the economy, as their consumer.

Mention may be made, in this connexion, of the investigation made in Italy (and completed in 1961) by SVIMEZ. The object was, in the first place, to produce an estimate of the composition of the actual population according to degree of qualification, on the basis of present-day technical trends. Each professional qualification was correlated to a degree of instruction, thus making it possible to deduce the number of holders of various diplomas to be trained each year. It was even possible to make estimates for teacher-training to achieve that objective.

A similar study has been made in France by Mr. Jean Fourastié. Like the Italian study, it cannot be regarded as completely reliable, in the present state of statistics, but both should serve as models. Not only should all countries undertake similar studies, but it might even be possible to envisage a sort of permanent investigation aimed at reconciling the needs of the economy and the direction of education as far as possible.

Integral estimates

On the basis of essentially quantitative demographic forecasts and the qualitative forecasts referred to above, a general education plan can be envisaged which would take very considerable account of the economy's manpower requirements. Except where natural resources are lacking, over-population, chronic unemployment or underemployment would cease to exist.

While efforts should tend in this direction, it would obviously be wrong, of course, to contend that education programmes and general plans could be entirely governed by these considerations. In particular, the forecast cannot cover a period as long as the active life of a man, i.e., forty or fifty years. New discoveries, as already stated, are events which are too capricious to allow us to see so far ahead. A man trained in the light of immediate or imminent necessities may later find his professional activity placed in jeopardy by a new invention.

It may be advisable, as a protection against this eventuality, to avoid excessive specialization, to develop adaptiveness and to organize seminars or courses lasting several months during which adult professional workers could bring their knowledge up to date.

Effect of education on social stratification

While social origin—which implies the existence of classes or categories—has an influence on the way children are educated, conversely, education bulks fairly large as a factor determining the social status of the adult. In itself this rise in the social scale thanks to education is a good thing, provided always that the selection by examination is correctly conducted. Nevertheless, divergencies deepen between men when they enter active life: in some countries, the difference between elementary and secondary education is such that it often produces a lifelong gulf between the individuals thus moulded.

It is not easy to indicate with certainty the most appropriate solution, for the question is one of reconciling objectives which are different from, if not opposed to, each other. In addition, account has to be taken of the diversity of countries and situations. Nevertheless, any premature separation of pupils may be considered dangerous even if based on their real merits. Common instruction for all children of a given generation for a period of years has the advantage, in fact, of not only reducing the family handicap referred to above, or at least of preventing it from producing a final and untimely break, but also of creating lasting relations and a certain community of thought conducive to subsequent social cohesion.

The foregoing observations apply particularly to the developed countries. In the underdeveloped ones the question is even more vital. As we have seen, the training of middle and higher grade staff is a prime condition for development. However, it produces a considerable gap between its beneficiaries and the popular masses, a gap which is widened by the fact that even with the best will in the world it is not possible to go very far in providing a general coverage of elementary education, since the number of teachers to be found is more than the already educated generations can provide.

Those who accede to higher education thus find themselves on the same level as their colleagues in the developed countries, but by the same process terribly remote from large numbers of their compatriots. This is one of the difficulties of development: unable to proceed at the same speed in all sectors, it inevitably leads to dislocations.

The difficulty is even greater where the higher education has been received in a developed country. A certain acculturation takes place which directly results in partial uprooting. It even happens that on completion of his studies, the young man makes no attempt to return to his home country, finds a job and founds a family in the country or region where he has received his education, in which case the loss is considerable, for the country loses a man who is fully trained and often of outstanding ability.

The choice between education received locally and one acquired abroad cannot be subjected to hard and fast rules, for it may involve basic impossibilities; however, it is advisable never to lose sight of the risk indicated above.

Summary and conclusion

This brief survey of the social factors of education makes clear, first of all, the vital importance of reviewing traditional concepts.

It also indicates the possibility and even necessity of formulating education plans of some duration, even going beyond that of the economic plans. Educating people is henceforward part and parcel of a country's general development. Not content with satisfying the needs of the individual, education concerns the very life of the nation and is its most precious ferment.

Chapter VI

Human resource assessments[1]

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In order to formulate a strategy of human resource development for a particular country, it is essential to make a systematic assessment of its human resources problems and requirements. Such an assessment is much more comprehensive than a manpower survey or a study of formal education. It should include, at the minimum, an analysis of the following: (a) manpower requirements; (b) the system of formal education; (c) institutions for in-service training and adult education; and (d) the structure of incentives and the utilization of high-level manpower. It might also include some appraisal of problems of health improvement and nutrition. And, of course, it must be based upon an analysis of demographic trends and be related realistically to the social, political, and economic environment of the country.

In assessing the problems of human resource development, the most difficult task is estimating the future requirements for manpower. If these can be specified, it is then possible to plan programmes for the building of educational and training institutions, and to estimate the costs involved. Also, if net requirements for manpower are estimated, it is possible to calculate the annual rate of withdrawal from the labour force because of death, retirement, or other causes during a planning period, thus arriving at figures for gross requirements. In the discussion to follow, therefore, it is assumed that the policy planner is in a position to handle such tasks, and that his major problem is the estimation of future manpower requirements as a basis for the other decisions which he will have to make. Stripped to its essentials, the estimation of manpower requirements involves a reasonably comprehensive analysis of the present situation, and, using this as a base line, a forward estimate of long-run requirements for a period of perhaps ten to twenty years.[1]

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[1] This paper, with minor variations, is the same as Chapter IX in Frederick Harbison and Charles A. Myers, *Education, Manpower and Economic Growth*, New York, McGraw-Hill, 1963. It is part of a broader analysis of the strategies of human resource development and their integration into general development planning. It was prepared originally, however, for this manual.

The analysis of the present situation

The assessment of present and short-term manpower requirements, while fundamental as a basis for longer-range estimates, presents few serious methodological problems. Short range is considered here as a period of one to three years. The essential elements are the following: (a) an inventory of employment and unemployment and short-term requirements for manpower; (b) a general appraisal of the educational system; (c) a survey of existing programmes for on-the-job training; and (d) a brief analysis of the structure of incentives and the utilization of high-level manpower.

The inventory of employment and short-term requirements

An analysis of the present situation starts with a review of the available facts about the population and an inventory of the existing labour force. Where possible the probable or actual labour force participation rates for males and females should be obtained. Then an inventory of employment and short-term requirements should be made for each major sector of the economy. These should include as a minimum: agriculture, construction, mining, manufacturing, public utilities, transportation and communication, trade and commerce, education, and government services (exclusive of education). Where appropriate, a more detailed choice of sectors can follow the classification used for the national accounting system or the economic development plan.

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[1] This chapter does not attempt to describe in easy steps the procedure for making manpower surveys. For this purpose, some excellent handbooks are available, and more are likely to appear in the future. For example, see the following: (a) *The Forecasting of Manpower Requirements* (prepared by the Bureau of Labor Statistics of the U.S. Department of Labor for the Agency for International Development), U.S. Department of State, Washington, Feb. 1963 (mimeo.). (b) Herbert S. Parnes, *Forecasting Educational Needs for Economic and Social Development*, The Mediterranean Regional Project, Organization for Economic Co-operation and Development, Paris, Oct. 1962.

Within each sector, an estimate should be made of total employment as well as the extent of unemployment or under-employment.[1] In addition, employment should be broken down by major occupational categories in order to identify various classes of high-level manpower. Here the following categories made by Parnes for the Mediterranean Regional Project of OECD are useful:[2]

Class A includes all occupations for which a university education or an advanced teachers college degree or its *equivalent* would normally be required.

Class B includes occupations for which two or three years of education beyond the secondary level (12 years) or its equivalent may be required.

Class C includes occupations for which a secondary school education (either technical or academic) or its equivalent would normally be required.

A fourth category, Class D, encompasses all occupations not included in the above three classes. Parnes has grouped all of the 1,345 occupations defined in the International Standard Classification of Occupations into these four classes.

There are, of course, obvious difficulties involved in the use of this or any other system of occupational classification which attempts to relate occupations to formal education requirements. For example, the educational requirements for a graduate engineer, a physical scientist, an agronomist, or a doctor are reasonably clear. But those for teachers are not. In an advanced country, most primary school teachers would fall in Classes A or B since they would have a minimum of 14 to 16 years of formal education. But in many underdeveloped countries, the majority of elementary school teachers may have no more than a primary school education. In this case, they would fall in Class D and would not appear in the high-level manpower categories. The requirements for managers, technicians, and foremen likewise are difficult to define in educational terms. The educational level of persons in a wide variety of high-level

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1. For a good description of this process, see Parnes, op. cit., Section II.
2. Parnes, ibid., Appendix B., pp. 77-87. An alternative approach, using six occupational levels with educational requirements, has been used by the French Manpower Committee, see Raymond Poignant, 'France', in *The Planning of Education in Relation to Economic Growth* (papers presented at Policy Conference on Economic Growth and Investment in Education, Part IV, Washington, 16-20 Oct. 1961), Paris, Organization for Economic Co-operation and Development, 1962, pp. 19-20.

Seven occupational-educational requirements categories are used in Czechoslovakian manpower planning, see: Jan Auerhan, 'Problems of Forecasting of Skilled Manpower Requirements', mimeographed paper at Regional Seminar on Problems of Planning the Labour Force and its Employment, Cairo, 11-22 March 1963 (organized jointly by the International Institute of Labour Studies, Geneva, and the Institute of National Planning, Cairo).

occupations depends in part on the available supplies of educated manpower. In a relatively advanced country, employers can and do insist on higher standards of formal education than in less developed countries. In making the employment inventory, therefore, it is desirable to ascertain the actual educational attainment of the major categories of the labour force. Where this is impossible, one must rely on experienced judgement.

Within the three classes of high-level occupations described above, it is necessary to distinguish those requiring pre-employment technical training and those requiring largely general education. And in Classes A and B it is necessary to further subdivide the occupational categories to be able at least to distinguish managerial and administrative jobs from professional, scientific, and technical occupations. An even more detailed breakdown, of course, is desirable if the information can be obtained.

The methods for making manpower inventories are now well known.[1] They may be based on special or general census data, if available, or upon establishment surveys. The sample establishment survey, using interviews to supplement questionnaires, is perhaps the most reliable method, and it has one additional advantage of great importance. The establishments surveyed may be asked to report existing shortages as well as anticipated short-term needs for one to three years. They can also be asked to report on existing or desired qualifications of the labour force. Many of the recent manpower studies conducted in newly developing countries have in fact been based on some sort of establishment survey, and the inherent advantages of this method would warrant its use even where general census data is available.

The inventory of employment and short-term requirements, if conducted properly, serves three major purposes: it identifies immediate, short-range needs; it provides a base line for comparison with other countries and for making forward estimates; and it establishes a framework for making subsequent periodic inventories of manpower requirements. The manpower inventory necessitates collection of considerable statistical data, and it requires the use of experienced judgement (particularly in relating occupations to education). The conceptual and methodological problems, however, are relatively simple.

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[1] Note the references already cited on handbooks or manuals. By the middle of 1962, a sizeable number of manpower surveys had been made by experts from ILO, US-AID, the Ford Foundation, and other organizations providing technical assistance in this field. Many others are planned or in progress. Although actual publications setting forth methodological procedures are few, those persons who have made surveys can and do instruct others in the techniques involved. See also papers submitted to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, Geneva, 1963 (Section B-2: Techniques of Manpower Assessment and their Implications).

General appraisal of the educational system

The task of appraising the existing educational system is reasonably clear-cut. Data are needed on enrolments by age groups for the various grades in each educational level, the numbers of teachers by level and by qualification, the teacher-student ratios, wastage or drop-out rates, and school completion rates for each level. The curricula at each level should be evaluated in terms of immediately needed changes or improvements. Capital and recurring costs should be estimated for each level of education, and within each level for various types of education such as academic, technical, teacher training, and others.

In many countries, specialized quantitative and qualitative studies are made for each level and type of education. Thus there may be surveys of primary schools, secondary schools, or post-secondary and higher education. Often technical education is singled out for special attention. It is not necessary to discuss here the techniques used in such studies. It is important to note, however, that many education surveys made in the past have neglected entirely any analysis of training on the job or the structure of incentives. Educational assessments should be made as part of a broader analysis of human resource problems, and the failure to do so makes it difficult subsequently to construct realistic long-range targets for development.

The survey of programmes for on-the-job training

Human capital formation may start with formal education, but it does not end there. Most managerial, technical, and craft skills, for example, are developed on the job much more effectively than in vocational schools. Indeed, in many countries vocational or trade schools are quite inefficient and wasteful instruments of human capital formation. Better craft training would result from shifting more responsibility for skill development to the employing institutions. But in any case, it is just as important to make an analysis of the processes of skill development of employed manpower as it is to make a survey of formal educational institutions.

In particular, attention should be given to programmes of administration and management development, supervisory training, craft training, and apprenticeship. It should cover experience of large and small establishments of both government agencies and private enterprise. And, indeed, the discovery of the lack of concerted on-the-job training efforts is in itself important. An attempt should be made also to ascertain the degree of co-operation between the employing institutions and the vocational schools, the judgements of employers with respect to the usefulness of such pre-employment training, as well as the costs of in-service training programmes.

Closely related to on-the-job training are programmes of general adult education, fundamental education as part of community development projects, and agricultural extension projects. A general study of the existing and possible roles of such activities is, of course, an essential part of any comprehensive human resource assessment.

Analysis of the structure of incentives and the utilization of high-level manpower

Another significant but commonly neglected facet of the assessment of the current situation is the structure of incentives. Ideally, it would be desirable to have in every country a nation-wide survey of wages and salaries coupled with analysis in depth of non-financial incentives which motivate persons in the various occupational categories of the labour force. Few countries can afford to make such a comprehensive survey. However, it is possible to make an examination of a small number of critical occupations. If there are critical shortages of engineering technicians, for example, the differentials in compensation between subprofessional and fully qualified professional personnel might be explored. The differentials between certain administrative and technical jobs can be examined in cases where there is evidence to indicate a shortage in one and a surplus in another. The relative preference of persons for jobs in the city as compared with the rural areas should be noted, as well as the existence of unfilled places in agricultural and junior technical training centres. In many countries, furthermore, there is widespread underutilization of certain kinds of highly skilled manpower, and the reasons for this should be determined.

In most countries, the problems of incentives and proper utilization of manpower are well known to informed people in government and private enterprise. Admittedly, it may be difficult to quantify such problems. But to overlook them completely in a human resource assessment is a serious conceptual error.

The time available for surveys of the present situation may be short or long, and the staff may range from a single person to a large team of experts. As a practical matter, the human resource planner must do the best he can with the information he is able to get within prescribed limits of time and budget. Nevertheless, a preliminary survey, even if it is superficial, is better than no survey. The availability of statistical data is a great asset, but at the same time it is often necessary to make assessments even when statistics are poor or non-existent.

The manpower assessment, no matter how superficial or tentative, should cover the four areas described above. A survey of formal education by itself, or an assessment of present and short-term manpower requirements, without adequate consideration of on-the-job training and the structure of incentives, can be quite misleading. It may be necessary, of course, for several experts to collaborate in making an assessment of broad scope, but the net result should be an integrated rather than a one-sided analysis. It is far more important, in our judgement, to aim for comprehensiveness than thoroughness in initial surveys of human resource development problems. For if the scope of the assessment of the present situation is too narrow, responsible programming for future development becomes quite unrealistic.

Procedures for estimating future requirements

The most difficult aspect of manpower analysis is the determination of long-term future requirements. Because of the long lead time required for human resource development, requirements must be estimated for a minimum of ten years and preferably for two decades in advance. This is obvious when one considers the time required to build schools, to train teachers, and to fill the educational pipelines in primary and secondary schools in order to expand the number of university graduates. For example, most of the potential university graduates for ten years in advance are already in secondary schools. Children now entering primary school will not emerge as secondary school leavers for approximately twelve years, nor as university graduates for at least fifteen years. Human resource development planning, therefore, usually requires a longer time perspective than that encompassed in most economic development plans.

There is no generally accepted methodology for estimating future requirements. Nor is there a clear concept of the meaning of the term 'future requirements'. Some people talk about 'predicting' or 'forecasting' manpower requirements; others contend that they are making 'projections'. And still others emphasize the process of forward 'target-setting'. Before elaborating my concept it may be useful to examine briefly some of the more common approaches which are in current use.

A rather simple method of estimating future requirements is to ask existing establishments to specify them. This will provide an informed judgement of short-term requirements, but it is quite unreliable for long-run estimates. The establishments which may be in existence ten or twenty years hence may not be at all the same as the present ones. Furthermore, most employers are unwilling or unable to estimate what employment will be in the long run. As one exasperated owner of a business in Jordan is reported as saying, 'Such guessing is an impious act, for only Allah knows what the future may hold.' For these reasons, it is best to consider that forecasts made by individual establishments are essentially part of an assessment of the present situation rather than a practical means of making long-run estimates.

Another method is to use past trends as a means of projecting future requirements.[1] This method has been used in some advanced countries to estimate needs for high-level scientific and engineering manpower as well as for teachers. The procedure is to extrapolate past trends in the growth of the number of persons in the particular occupation, and then correlate this with total employment, production, population, gross national product, or some combination of such variables. The regression table thus obtained is then used to project future requirements for each occupation.

This projection method has the advantage of simplicity, but its usefulness is limited. In many countries it is impossible to get past data for an adequate time series. And even where the data may be available, the assumption that future relationships can be derived from past trends is open to question. Actually, the concept of forward planning usually implies that the future will be different from the past. In some cases, however, the projection of trends may be useful as a check, along with other exercises performed in the process of constructing forward targets.

A more complicated method is what Beckerman and Parnes describe as the 'manpower requirements approach to educational planning'.[2] Here the estimation of changes in productivity is the critical factor. The steps in this approach are the following:

1. The analysis of the existing manpower structure is made along the lines which were described earlier.
2. The patterns of output for the various sectors of the economy are projected for the forecast year, usually as set forth in an economic development plan. Then total employment for the economy as well as for each sector is estimated on the basis of some assumptions about productivity.
3. For each sector, the total employment for the forecast year is allocated among the various occupations according to the occupational classification system which has been chosen. Then the requirements for each occupational category are aggregated from the various sectors to

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[1] See Harold Goldstein, 'Methods of Forecasting Demand for and Supply of Scientists and Engineers', CEEC, STP (58) 1, June 1958 (mimeographed) for description of this and other methods of projections in European countries. Also see *Forecasting Manpower Needs for the Age of Science*, Paris, OECD, 1960; S. O. Doos, 'Forecasting Manpower Requirements by Occupational Categories' (prepared for Training Course for Human Resource Strategists, Frascati, Italy, 1962), Paris, OECD, Directorate of Scientific Affairs (mimeographed); and National Science Foundation, *The Long Range Demand for Scientific and Technical Personnel, a Methodological Study*, Washington, 1961.

[2] See Parnes, op. cit., and also Wilfrid Beckerman, 'Methodology for Projection of Educational Requirements', Mediterranean Regional Project (Project STP-22), DAS/MRP/62.2, Annex C, Paris, OECD, Directorate for Scientific Affairs, 1962, 7 pp. (mimeographed).

give the total stocks required in the forecast year. Here, however, allowance must be made for the effects of increases in productivity on the occupational structure. As productivity increases, of course, the proportion of persons in high-level occupations increases relatively to those in the lesser skilled jobs. In practice, however, one must make assumptions regarding the influence of productivity increases on occupational structure, since there are very little reliable data on which to base objective calculations.

4. The supply of personnel with each major type of educational qualification is estimated for the forecast year on the basis of present stocks, anticipated outflows from the existing educational system as presently planned, and allowances for losses due to death, retirement, and other reasons for withdrawal from the labour force.
5. The estimated outputs from the educational system are compared with the required outputs as determined in step 4.
6. The orders of magnitude for expansion of the educational system are then established to close the gap between anticipated requirements and presently expected supply.

This method, perhaps, has the greatest appeal to economic development planners, and with modifications has been used by most of the countries in the Mediterranean Regional Project.[1] It links manpower requirements to productivity; it is designed to identify high-level manpower bottlenecks which could hamper production; and thus it appears logically to relate human resource needs to economic requirements.

This approach, however, has some shortcomings. First, although the productivity criterion may be appropriate for the manufacturing, construction, mining, and transportation sectors, it is not so useful for estimating high-level manpower requirements in public health, general activities of governments, and many kinds of services. It is questionable, also, whether in agriculture it is possible to estimate future employment by predicting what productivity will be, particularly in countries where there may be extensive disguised unemployment and under-utilization of labour on the land. Some countries, of course, merely assume that the labour which cannot be employed in other activities will have to be retained on the land. But, in any case, a simple estimate of future productivity is unlikely to provide many clues about the quantity and quality of high-level manpower needed in agriculture.

Perhaps the most troublesome problem is the lack of empirical data on which to base estimates of expected increases in productivity and the bearing of these on changes in occupational requirements. In practice, one can do little more here than to make general assumptions. For example, one may assume that in the forecast year the average productivity of all factories in a particular sector will equal the present productivity of the most modern ones. Or, one can assume that average productivity of the manufacturing sector in country A in the forecast year will approximate present productivity of a comparable sector in country B which is somewhat more advanced.[1]

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[1] This is a co-operative education planning effort by Turkey, Greece, Yugoslavia, Italy, Spain and Portugal, which was organized by the Office of Scientific and Technical Personnel of the Organization for Economic Co-operation and Development (OECD).

Another problem inherent in this approach, as well as most others, is the determination of required educational qualifications of high-level occupations for the forecast year. To a large extent, these may depend upon the supply structure of educated persons at that time. Here again one is forced to make assumptions, and these are often made on the basis of comparisons with other countries.

Another possible criticism of the manpower requirements approach is that it gives an impression of making forecasts or predictions about a future situation. Because of the complexity of economic, social, and political events, predictions are dangerous. However, the manpower requirements approach need not be linked to forecasts and could be used as a method for target-setting.

In the end, the validity of the 'manpower requirements' approach rests upon the reasonableness of the assumptions made about productivity, and these assumptions, in most cases, must be based upon international comparisons. Some countries, which have adequate time-series data, may make projections on the basis of past trends, and for some manufacturing sectors it may be possible to estimate both productivity and occupational requirements where the precise future technology of production has already been determined. Nevertheless, it is quite misleading to think that future manpower requirements based on productivity analysis are less subject to arbitrary judgement than other approaches.

Beckerman and Parnes[2] also have described an alternative approach which they call 'the social objectives method'. Unlike the manpower requirements approach which attempts to define education needs in terms of productivity and a given pattern of economic growth, the

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[1] For example, a Puerto Rican manpower survey made in 1957 assumed that industrial productivity in that country would rise by 1957 to the level of the United States in 1950, and that parallel occupation groups should have equivalent educational requirements.

The survey of manpower and education requirements in Italy made its productivity calculation (except for agriculture) by assuming that in 1975 productivity would reach that attained by France in 1960.

For further discussion of problems of productivity assumptions see Parnes, op. cit., and Michel Debeauvais, 'Methods of Forecasting Long-Term Manpower Needs' (paper prepared for Training Course for Human Resource Strategists, Frascati, Italy, 1962), Paris, OECD.

[2] See Parnes, op. cit., and Beckerman, op. cit.

'social objectives' approach recognizes that education serves more than economic ends. It assumes that a more educated labour force will itself tend to promote economic growth, and that it is neither necessary nor desirable to attempt to measure specific manpower requirements for economic objectives. This method concentrates, therefore, on identifying deficiencies in the present educational system in the light of social and educational objectives, and it projects future needs in terms of estimated population increases and the desire of persons for education at various levels. Certain goals are taken for granted such as elimination of illiteracy, increasing enrolment ratios in secondary education, decreasing the student-teacher ratios to desirable levels, lowering wastage rates, and improvement of standards. These goals, in effect, are suggested by making comparisons with other countries. Then the targets for future development are based upon a statistical calculation of the logistics and cost of satisfying these goals in varying periods of time.

This approach has been favoured traditionally by educators. It by-passes completely the difficult determination of occupational requirements. But at the same time it overlooks essential economic problems. If this approach is used, there is likely to be little integration of the work of the educational planners and the economic planners, and in the end the latter are likely to recommend that expenditures for education, along with other social activities, be given a lower priority than investments in projects which are clearly productive and appear to contribute more directly to economic growth.

Other methods of estimating future manpower and education needs have been suggested, including the very imaginative Tinbergen-Correa model.[1] Using what they call a simple model of the input-output type, the authors attempt to relate directly needed secondary and higher education outputs to given rates of economic growth, without using the intermediate step of calculating the occupational requirements. Essentially, the number of persons required from each educational level is calculated from a series of linear difference equations which relate the stock of persons completing a given level of education and the number of students in each level to the aggregated volume of production. Its purpose is to suggest what structure of the education system is needed in order to 'let the economy grow at a certain rate', and how that structure should change with changes in the growth rate.

Certainly, the mathematical formulation of this model offers no grounds for criticism, but the assumptions implicit in the use of certain technical coefficients are open to question. For example, it is assumed that the number of persons with secondary education and also with

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1. J. Tinbergen, 'Quantitative Adaption of Education to Accelerated Growth' (paper prepared for Training Course for Human Resource Strategists, Frascati, Italy, 1962), Paris, OECD, Directorate for Scientific Affairs (mimeographed).

higher education is proportional to the volume of production in the same time period. Such an assumption is based upon judgement pure and simple. Likewise, the coefficients expressing teacher-student ratios are based upon rather questionable assumptions, those actually used being derived from United States experience. Depending upon one's judgement, of course, coefficients derived from other countries could be used, or perhaps they might even be artificially constructed.

Another implied assumption in the Tinbergen-Correa model is that in the present situation the number of persons with secondary and higher education is the correct number for the existing level of aggregated production. In practice, however, there are usually acute shortages or even sizeable surpluses. Moreover, this model implicitly assumes that technology and productivity in the time period remain constant, and it thus completely overlooks what effect such factors might have on required occupations and hence required educational qualifications. Finally, the model as presently developed draws no distinction between types of education (technical or academic), makes no allowances for qualitative imbalances in school curricula, and fails to distinguish between the major economic sectors of the economy.

In conclusion, the practical use of the Tinbergen-Correa model, as well as other approaches, depends upon the validity of the assumptions made with respect to empirical facts. To the extent that empirical evidence is unavailable, one must make judgements. Thus this model, although giving the appearance of methodological precision, is actually no less dependent upon guesswork than any other approach. To be sure, when empirical evidence becomes available, the assumptions regarding the technical coefficients may be changed accordingly. Likewise, the model can and should be expanded to include other variables such as increases in productivity, and with refinements it could be used to make estimates for educated manpower by occupation and by sector. But at present, it provides no substitute for the use of experienced judgement, and is no more objective than any other approach.

Before proceeding to outline some of my own suggestions on methodology, it may be useful to summarize my own views on the existing methodology.

First, there is confusion about the *concept* of estimating future needs. Is the aim to make forecasts, to construct projections, or to establish targets? The distinction is important. In the modern world, it is really impossible to predict what is going to happen in particular countries or regions, regardless of the techniques which may be employed. Here I find myself in agreement with Beckerman who has said: 'People who believe that economists should be capable—provided they are smart enough and provided they equip themselves with the necessary gadgets, such as input-output tables, demand functions, intra-firm comparisons, field surveys, etc.—really to foretell the future are, to my mind, in the same category as members of ancient tribes who attributed similar powers to their witch doctors.'[1]

Projections, of course, are different from forecasts. They express the logical consequences of assumed courses of action. They are helpful in determining what needs to be done if certain objectives are to be attained, or perhaps what will happen anyway if certain objectives are in fact achieved. Targets, on the other hand, are operational direction indicators based upon projections and reasonable judgements. The methodology of manpower analysis would be greatly improved if both the concept and the term 'forecast' were discarded, and if analysts would indicate clearly when they are making projections or setting targets.

Second, the purposes of manpower estimates are too narrowly conceived. Most projection or target-setting exercises aim only at estimates of requirements for formal education. This is important, but forward estimates of human resource development needs should be designed also to identify on-the-job training needs, required changes in the structure of incentives, and measures for better utilization of high-level manpower. Human resource development should never be equated exclusively with formal education development, and any methodology which assumes that they are is inherently deficient.

Third, the validity of all the various approaches depends in the final analysis upon the *judgement exercised in making assumptions*. Empirical evidence upon which to make really objective findings is not now available, nor is it likely to be in the future. The development of mathematical models, though useful in giving a systematic view of possible relationships will not itself bring about greater accuracy or precision in forward estimates.

Fourth, in practice most manpower analysts agree that it is necessary to combine different approaches. For example, the so-called 'social objectives approach' which stresses enrolment ratios and comparisons between countries can be combined with the 'manpower requirements' method which establishes a relationship between education and economic growth and identifies skill bottlenecks which may seriously impede economic progress. And similarly the use of mathematical models is appropriate if one is clear about what he should solve for as well as about the range of the assumptions he is making.

Finally, as suggested earlier, the major problems of human resource analysis are conceptual. They involve the purposes of manpower estimates, the scope of assessments, and the relevancy of qualitative as well as quantitative data. The problems of methodology, particularly those requiring judgement in making assumptions, are far from solved, but progress here would be more rapid if there were less confusion about concepts.

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[1] W. Beckerman, 'Long-Term Projections of National Income' (lecture for the Training Course for Human Resource Strategists, Frascati, September 1962). Available through OECD, Directorate of Scientific Affairs, Paris.

The lack of empirical data, though admittedly a problem, gives us less concern. The development of clear concepts and systematic methodology will ultimately determine the kind of empirical data which is most relevant, and thus perhaps forestall the collection of facts and figures for which there would be little use. In any case, the present dearth of statistical data provides no excuse for failure to develop sharper concepts and more systematic methods of analysis.

The target-setting approach

In estimating forward requirements for manpower, the purposes of human resource development must be clearly understood. Without some kind of normative rationale, any exercise in estimating future needs is futile. Thus the first principle in the analysis of manpower requirements is that goals must be specified. This is clearly a conceptual matter. An educated, skilled, and reasonably healthy population is an essential condition for economic growth, but at the same time it is an end in itself. There is no reason to believe that the people of the free world place a higher value on an increase in material wealth than on an increase in health, the expansion of educational opportunities, and the opportunity for self-development of their innate capacities. They want all of these things, and more.

In more specific terms, the goals of a society are often expressed by its leaders, sometimes with or without the consensus of the population. For example, the leaders of an underdeveloped or partially developed country may propose goals such as the following: land reform and improvements in agricultural production, universal primary education, rapid industrialization, a position of leadership in the struggle for independence against neo-colonialism, the rapid replacement of expatriates in high positions by local national citizens, a huge power and irrigation dam, a steel mill, a television network, an international airline, or an impressive university of spectacular architectural design. Some of these goals are economic, some political, some cultural, and others predominantly status symbols. The advanced countries, likewise, have a mixed bag of goals. They may seek expansion of industry and trade, full employment, expansion of higher education, acceleration of basic and applied research, armed forces capable of defence from any enemy, more opportunity for cultural creativity, or the prestige of sending a man to the moon. To achieve any or all of these goals, high-level manpower is required. And it would be very difficult for any country to attempt to make a sharp distinction between the human resources required for economic goals and those required for social, political or cultural ends.

The human resource planner thus has a difficult problem. In assessing the nature of goals in a particular country, he is aware that some are openly stated, some are simply implied, and others may appear to him to be frivolous or capricious. He must somehow select those which the available evidence indicates are most important and most generally accepted. And he must check the legitimacy of his selections with opinion leaders, politicians, statesmen and others. Obviously, however, if all goals were to be attained within a short time, the costs of developing the required human resources would be beyond the means of any country. Consequently, both goals and requirements may need to be reassessed, and priorities have to be determined by the country's responsible leaders.

The second principle is that major reliance should be placed on making reasonable comparisons both within an economy and with other countries. In modern times, most nations tend to formulate their economic, social, and political goals by comparing themselves with other countries. They may seek to follow good examples set by others; they may be intent on following a divergent path from a certain country; or they may wish to avoid particular mistakes which others have made. With twentieth century means of travel and communication, it is almost impossible for a country to escape such comparisons. Similarly, the propensity is strong to compare one region of a country with another. For example, educational goals in many countries are based on the idea that the most backward regions should, in the future, be brought up to the present average standard, or that the general average should be brought up to the standard of the presently most advanced region. Here the comparative analysis part of the so-called 'social objectives approach' has merit, but it should be extended to include the comparison of economic as well as social and cultural objectives.

The third principle is that in estimating future requirements the human resource planner should concentrate on setting targets rather than on making forecasts. The purpose of target-setting is not to make a prediction of what will take place; nor is it to make projections on the basis of limited assumptions of attainment of one or two specific courses of development. Its purpose is rather to *influence* the future course of development. A target indicates a *direction* for action. Its precise quantitative dimension is far less important than its function of indicating the direction of activity for achievement of specified goals.

If it is clear that one is engaged in a target-setting exercise, no apologies need be made for basing estimates where necessary on judgement. Of course, the data, the assumptions, the projections, and the comparisons on which the judgements are based should be clearly indicated. The target should establish a correct direction for policy, but its location ought to be changed as better judgements are possible. If appropriate, a range of targets based upon alternate assumptions may be presented. But in setting targets the main concern is to establish a course of action, even if this must be tentative or preliminary.

A fourth principle is that requirements for human resource development should be comprehensive. It is not enough to establish a single target for higher education, for secondary education, or even for all formal education. The closely associated targets for on-the-job training, for changing the structure of incentives, for importing expatriate manpower, for better utilization of skills, and for creating adequate employment opportunity should be established along with educational targets. The assessment of human resource development 'in pieces' is perhaps the greatest single deficiency of the manpower and educational surveys which have been conducted in the past. And this deficiency, incidentally, is responsible for much of the difficulty experienced in the integration of human resource planning with general planning for development.

Within the context of the four conceptual principles stated above, the problems of methodology come into sharper focus. Among the more important are the following: the sensitivity of estimates, relationships of occupations to education, the making of comparisons, the construction of 'multipliers', and the interpretation of 'shortfalls'.

The sensitivity of long-range estimates of manpower requirements is governed largely by the analysis of the present situation. The occupational categories, the sectors chosen for analysis, and the problem areas which are identified constitute the base lines for construction of long-range targets. If detailed breakdowns of sectors and occupations are desired, (i.e., if great sensitivity in analysis is thought to be important), then the survey of the present situation must be designed accordingly.

It is neither necessary nor desirable to estimate needs for a large number of specialized occupations. In dynamic economies there is a great amount of movement from one occupation to another, and the needs for specialized skills are apt to fluctuate rather sharply. It is necessary, of course, to calculate the numbers of persons who should have a secondary or higher education or its equivalent, and here a distinction needs to be made between technical and general education. It is not necessary, however, to distinguish occupations requiring very specific training, particularly if much of this training can be acquired on the job. A few examples will serve as illustrations. Certainly, there is no need to calculate separately the long-run needs for carpenters, painters, fitters, welders, and so forth. A general estimate for highly skilled craftsmen is sufficient. In the sub-professional categories, principal foremen and technicians in industry may be lumped together, as can nurses and other medical technicians. But, in the higher administrative and professional categories, more distinctions are required. For example, separate estimates are desirable for doctors, scientists, and engineers, and if possible the major branches of science and the major branches of engineering (mechanical, civil, electrical, and industrial) should be distinguished. In the managerial and administrative category, a distinction must be made between executives in fairly large and complicated establishments and the manager-proprietors of small family businesses. And, finally, the requirements for teachers at the three levels of education should be estimated, with a further designation, if possible, of those needed for the teaching of technical and scientific subjects. In practice it is very difficult to get reliable information even on the limited range of occupations mentioned above, so that in most cases one is forced to use broader occupational categories.

The conversion of occupational requirements into educational requirements is one of the most perplexing problems in manpower analysis. As we have seen, Parnes made a threefold classification of occupations based on various levels of education or their equivalents. Parnes further points out, quite correctly, that estimates of educational requirements cannot be made mechanically on the basis of the total numbers in each classification. It is necessary to make assumptions, in Class A for example, about the proportions of persons in each group who should be expected to have completed a university education or an advanced teachers' college course, and the proportion who may be expected to fall into this group because of having 'equivalent' qualifications.

Except in the case of a few professions, there is no precise relationship between occupations and educational background. One cannot be sure whether an administrator or manager must have a university education. In many African countries elementary school teachers have only a primary education, whereas in the advanced countries they require completion of some form of higher education. Presumably, skilled craftsmen need a second-level education, yet petroleum companies have demonstrated that men who are hardly literate can be trained as painters, carpenters, or welders in less than a year. Thus the supply of educated manpower determines in part the demand also. In similar activities, an advanced country will absorb many more highly educated persons than an underdeveloped country. And in less developed countries, certain production processes can be designed to utilize effectively persons with very limited education.

Obviously, then, the assumptions about the relationship of occupations to educational levels will differ from country to country. And here again the manpower analyst must rely on judgement rather than on precise data. His estimate may have to be provisional, or even arbitrary. And this perhaps is fortunate, because it underlines the necessity for examining on-the-job training and other means of human capital formation, and demonstrates clearly the dangers of equating human resource development exclusively with the expansion of formal education.

The reasons for reliance on the comparative analysis of human resource requirements have already been given. There are, of course, many problems involved in making both inter-country comparisons as well as regional comparisons within a country. For example, it may be argued that an inter-country comparison is not appropriate unless the social and cultural conditions in the two countries are identical and unless the country with which the comparison is made has satisfactorily met its requirements. This is not so. In the first place, comparisons between countries are best made on a sector-by-sector basis. One compares not entire countries but rather agricultural sectors, industrial sectors, or education sectors. Secondly, it is not necessary to assume that manpower requirements have been met satisfactorily in the country of comparison. For example, if Country B which is more advanced has three times the proportion of engineers in its industrial labour force as Country A and still is short of engineers, this fact indicates that Country A may need to increase its proportion of engineers *more* than three times to satisfactorily attain a comparable level of industrial development. Or, if Country B has an oversupply of engineers, then Country A might lower its estimated requirements accordingly. The same is true in the case of intra-country comparisons between regions. The advanced region does not necessarily establish the desired target for the less advanced regions. The essential point here is that the process is one of comparison of manpower problems as related to sectors at different stages of development. And, as a general rule it is wise to assume that no country has solved its problems in a completely satisfactory way.

One of the outcomes of the comparative approach is the construction of multipliers or ratios from which to construct forward targets. In order to illustrate this point, let us take a somewhat oversimplified example. Assume that a comparison between two countries, A and B, shows the following:

	Country A	*Country B*
Number of persons with secondary education or more per 10,000 population	25	250
GNP *per capita* in U.S. dollars	$100	$500

Now, if we also assume that there is a high correlation between GNP and stock of second-level manpower, we could say that a tenfold increase in educated manpower might be necessary for Country A to have a fivefold increase in GNP. The ratio of increase in educated manpower to the increase in GNP, therefore, is 2 : 1. We may turn the example around, of course, and assume that Country A would have to increase its GNP by five if it hoped to increase its stock of educated manpower by ten times. In any case, the 2 : 1 ratio could be used to make an initial estimate of future requirements for persons with secondary education or more.

In practice multipliers or ratios can be calculated for particular occupational categories and for particular sectors. Adjustments are made to take care of existing shortages or surpluses in each country. And the ratios may be constructed after making comparisons not with just one but with several countries. These and many more refinements can be used in a comprehensive assessment. It is important to remember, however, that multipliers or ratios should not be used to forecast manpower requirements in the future. They are a means only of establishing targets which indicate an approximately correct direction for action and a general order of magnitude of required effort. Nor should one forget that the ratios are based upon assumptions rather than upon proven relationships.

Finally, there is the question of the significance of the 'shortfall'. Most surveys compare estimates of requirements for various categories of manpower with the anticipated output of the educational system as currently projected. The difference between estimated demand and expected supply is usually called the 'shortfall', and targets are then suggested for expanding educational facilities to close the gap. But the planner should never assume that this gap must be closed merely by expanding educational facilities. He should first explore the extent to which some of the requirements can be met by training on the job, by providing night-school classes for those already employed, by the temporary importation of skilled foreigners, or by improving the organization of work in order to utilize manpower more efficiently. Indeed, one of his principal tasks is the examination of alternative solutions of human resource problems, and in the end to weave them into a broad strategy of human resource development.

Conclusion

The estimation of long-range human resource requirements is a difficult but absolutely indispensable step in planning for social and economic development. Because this is a new field of interest, the concepts and methodologies of making forward estimates are not clearly formulated. Yet there is no reason to conclude that estimating manpower requirements is a less accurate and rigorous process than estimating the future needs for other resources. All forward estimates must be based upon assumptions, and they are accurate only to the extent that the assumptions are intelligently made.

The target-setting concept, rather than that of forecasting, is the more appropriate one for making long-term manpower estimates. And because most nations tend to formulate their goals for development by making comparisons with other countries, comparative analysis constitutes the core of the methodology for setting human resource development targets.

The targets, together with the policy measures selected to approach them, constitute the strategy of human resource development. And this strategy, in turn, should become part of a country's general plan for economic and social development.

Chapter VII

Manpower approach to educational planning

Methods used in the centrally planned economies

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Some basic features of educational planning

Educational planning in centrally planned economies is an integral part of over-all economic planning. All long-term development plans in these countries invariably include targets for education and culture which are closely linked up with other economic and social targets. This linkage is of a double nature: the achievement of educational goals is essential to the fulfilment of the whole economic plan; on the other hand the realization of the economic programme is a material premise for the attainment of educational targets.

There is another salient feature of educational planning in these countries which derives from the system of values upon which their society is built. Planning deals only with public education, for in centrally planned economies there are no private schools. From this it follows that the resources available for education at each particular stage of development are allocated according to a single plan on a nation-wide scale and all major decision-making with regard to education is the prerogative of the central and local governments.

The guiding philosophy behind the educational planning in these countries is that development of education is a means of providing society with the skills it needs for development and at the same time an inseparable element of levelling up the social welfare of the population. Resources which the State allocates for education constitute an impressive share of the national income in all countries with centrally planned economies and yet it may be argued that the amount of education given to the population could advantageously be increased. It is hoped that a time when the educational system will be expanded enough to allow any member of society willing to do so to receive higher education is not very far ahead. However, at this stage of economic affluence no centrally planned economy, in fact no society in the world, can afford it, and meeting the manpower requirements for development of the national economy and culture emerges as the major and primary task of the educational system. These considerations determine to a large extent the amount of allocation for education as well as its distribution within the education sector itself.

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[1] I am grateful to Mrs. N. Dunand for her help in the editing of the text.

The practical purpose of educational planning in centrally planned economies is establishing targets for enrolment in all levels and branches of the education system on the basis of political and social considerations, economic needs, demographic trends and the resources available. It is not easy to distinguish exactly what part each of these factors plays in shaping a national educational policy. The elimination of illiteracy, for instance, may be as much a political and social goal as a powerful means of accelerating economic growth. Training scientists and high-level manpower is nearly as essential for raising the general cultural level of society as it is for modern industrial development. When a standard for universal compulsory education has been set up, the most important single factor determining the needs for education expansion is obviously demographic growth. In the U.S.S.R., for instance, where eight years' compulsory education (age group 7 to 15) is in force, plans for expanding the educational system up to the eighth grade are based first and foremost on population growth. The same criterion is applied in other centrally planned economies from Poland to Cuba in which, of course, varying standards are in use and different time-periods are involved for the attainment of fixed targets.

Beyond such basic provision educational planning is considerably more complicated since it involves a number of other determinants. Among these determinants a special role is assigned in the centrally planned economies to assessment of manpower requirements for national economic development. This does not imply that manpower needs alone determine all educational planning in those countries. Indeed great emphasis is placed upon the cultural content of education and its influence on social development. The law defining the reform of education in the U.S.S.R. in 1958 explicitly states: 'The communist transformation of society is indissolubly linked with the education of a new type of man, in whom must be harmoniously combined spiritual wealth, moral purity and physical perfection.'[1] But manpower needs provide a framework within which this development takes place and allocation of resources to different types and levels of education is decided upon.

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[1] *Polytechnical Education in the U.S.S.R.*, Unesco, 1963, Appendix 1, p. 376

Since the centrally planned economies have by definition an over-all plan which is worked out and implemented in detail, the task of the educational planner is thereby easier, though great skill is required of him in handling the problems of deriving the manpower requirements from the national economic plan and establishing the educational targets corresponding to these requirements. After the financial implications of enrolment in higher and secondary specialized level have been calculated the planners face a dilemma: either to allocate resources that will make it possible to provide the economy with the necessary skills or to adjust downwards the development targets. There is no other alternative in a society whose life is shaped by a comprehensive development plan; otherwise the plan will be doomed to failure from the outset.

Usually it is the responsibility of the central planning authorities to allocate high-level manpower resources to various sectors so that industries which have priority in development receive proportionately more skills than others. In the early sixties, for instance, preference is given to chemical industries, while some twenty years ago similar priority was accorded to steel production. Other industries whose production at a given stage is considered less essential for the over-all economic growth may see their claims for skills curtailed. This will inevitably hold back the increase of output in certain areas of activities, but after all to plan is in a sense to choose between what is essential and what is not. Decisions in this respect are made by the planners according to priorities fixed for development by the legislative bodies.

Whatever educational targets have been ultimately set up, provision must have been made within the framework of the plan for adequate resource allocation. The realization of the educational plan is thus no longer conditioned by the availability of resources. Under these circumstances an accurate assessment of manpower requirements for development emerges as the major stage in educational planning in centrally planned economies. In view of the large quantities involved a small margin of error at this stage may have very heavy consequences for the whole national economy.

Factors affecting the needs for high-level manpower[1]

The difficulties of assessing manpower needs in countries developing at an average rate of 8-10 per cent of growth of the national income, are many. They include estimating anticipated structural changes in the national economy due to industrialization and urbanization;[1] shifts in the distribution of the working population among sectors with such different occupational patterns as industry and agriculture or public services; the increasing share of high-level skills in the total stock of the labour force due to the dramatic progress of science and technology; rapidly changing patterns of employment within individual industries; needs for a rational location of the stock of manpower throughout the country, and so on. The objective of full employment is, of course, a constant preoccupation of the planning authorities in all centrally planned economies.

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[1] Here and elsewhere in this chapter, unless otherwise specified, 'high-level manpower' is understood to mean graduates with university or equivalent degree and graduates with secondary specialized diploma.

The main factors influencing requirements for high-level manpower have been carefully studied since the early days of educational planning and knowledge in this respect is now considerably improved.[2] They fall, in order of importance, into the following main groups:

1. Amount of capital per unit of labour. The more complicated the technology and the deeper the use of capital equipment, the greater will be the need for trained manpower to cope with these techniques. Improvement in technology is generally accompanied by an additional demand for engineers and technicians and diminishing requirements for unskilled labour.
2. Number of workers. Any substantial augmentation of the total number employed necessarily calls for an increase of high-level manpower to direct the workers involved.
3. Complexity of output. The more complicated the product, or the more complex the working conditions (e.g. variations in geological conditions in mining) the greater must be the amount of high-level manpower in relation to the stock of labour.
4. Growing role of science and technology. The application of science to production and the introduction of innovations necessitates a new technology and a new organizational structure of production. This in turn begets further demands for trained manpower.
5. Structure of management. The more rational the structure of management and administration, the less will be the number of high-level personnel required for this activity, all other conditions being equal.

Apart from the foregoing, such factors as the general cultural level of the workers and the actual quality of the graduates themselves also influence the need for high-level manpower, though to a lesser degree. They all have a different impact according to the sector of the economy, but for all branches of production, though to a varying degree, technical progress really plays the decisive part in determining requirements for high-level manpower.

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[1] The urban population of the U.S.S.R. for instance, increased from 17.9 per cent of the total population in 1926 to 52 per cent in 1963. The annual rate of increase of urban population, except during the war years, has thus been 2.5 million.

[2] For recent interpretation of the subject see: V. E. Komarov, *Ekonomicheskie osnovi podgotovki spezialistov dlia narodnogo khozyaistva* (Economic basis for educating and training high-level manpower for the national economy), Moscow, Academy of Sciences of the U.S.S.R., 1959, pp. 61-83.

Methods of assessing high-level manpower requirements for development

The methodology of assessing manpower requirements in centrally planned economies evolved parallel to the general improvement of economic planning techniques and methods. It may be noted that in the initial stages of postrevolutionary development educational and training programmes in nearly all centrally planned economies were determined not so much by the manpower requirements of the national economy as by the financial resources and educational facilities available. For a number of years educational plans were not related to over-all manpower needs and followed a logic of their own. The first attempt to relate them directly to one another in the U.S.S.R., for instance, was only made in 1927, at the time when the first five-year plan was elaborated. Since then various approaches have been tried in forecasting manpower requirements which fall into three groups: (a) the method based on the ratios of saturation; (b) the staff-normative method; (c) a combined method which makes use of the two foregoing methods simultaneously. In what follows illustrations are taken mainly from the Soviet Union since this country has had the longest experience in planning.

Ratio of saturation method

Assessing manpower requirements by the degree of saturation of the total stock of labour with high-level skills is the oldest and simplest method in manpower assessment techniques. It consists in relating high-level manpower to the totally employed labour force (per 1,000 workers). Hence the expression 'by saturation'. In industries with an uninterrupted technological flow process, such as steel mills, electric power stations, certain chemical industries, cement factories, oil-refineries, as well as in coal, iron-ore mining and certain others, future requirements may be assessed by relating the number of high-level skills to the unit of capital equipment or physical volume of output. The most widely used of these coefficients is the ratio between high-level manpower and the total number employed by economic sector. It was basically by this method that the requirements in graduates for the first five-year plan in the U.S.S.R. (1928-32) were ascertained.

The technique of assessing high-level manpower requirements by this method implies the following successive operations: (a) calculating the share of high-level manpower in the total labour force for a number of years in the past; (b) assessing the total stock of labour for the period covered by the plan; (c) projecting the requirements for high-level manpower by extrapolation of past trends.

The drawback of this method is that the ratio of saturation of the labour force by high-level manpower is isolated from other major factors of production such as technological and organizational structures, which have a decisive bearing on the requirements for this category of manpower. When a country is undergoing rapid industrialization with all the sweeping changes in the structure of its economy that this implies, the ratio method may substantially underestimate future requirements for high-level manpower unless the current ratio of saturation is carefully adjusted in the light of past trends and anticipated changes. This method has gradually been improved to alleviate the inevitable imprecision in forecasting future requirements and is still in use, in combination with the assessment of manpower requirements by occupational composition of the labour force.

The staff-normative method

The staff-normative method is far more precise and takes into account, if only partially, the main factors affecting the magnitude of requirements for high-level manpower. The basic element underlying this method is the volume and type of workload by each person in the high-level manpower category. This method is directly linked with drawing up labour balances for over-all economic plans. The system of labour balances relates the available and prospective manpower resources of society to the needs of planned activities. The aggregate balances determine the distribution of manpower resources among various economic sectors by broad categories—unskilled, skilled, middle grade and high-level-scales.[1] Specific labour balances for a particular industry, economic sector or region go into greater detail by professional qualifications, the ultimate goal being the most rational and economical utilization of society's human resources.

For the purpose of assessing future requirements all high-level manpower is divided into two large groups. The first group comprises manpower engaged in the productive sphere and a number of activities belonging to the non-productive sphere, for which no single yardstick to measure the volume of work to be done by each individual is conceptually possible. In fact there is hardly any means of reducing the whole variety of work, for instance, in engineering, to a common denominator. In contrast, it is relatively easy for such professions as teaching or medicine. Hence they form the second large group of manpower for which a common yardstick can be found.

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[1] The present study is concerned with high-level manpower only. For planning formation and training skills at lower levels see H. Zelenko, 'Vocational and Technical Training in the U.S.S.R.', *International Labour Review*, Vol. LXXX, No. 6, Dec. 1959.

Numerically this group represents approximately half of the total number of graduates engaged in the U.S.S.R. economy. Requirements for these categories of high-level manpower are computed by means of teacher-student and doctor-patient ratios. Apart from the growth of population, its composition by age groups and sex, the future manpower requirements in the fields of education, cultural activities and health are determined by the general goal of society to level up social welfare and its ability to allocate material resources to achieve these goals. Since for each stage of development the educational or health standard (work-load by person employed) as determined by the available material resources is a given parameter, it provides a yardstick for ascertaining the prospective additional requirements in teachers and doctors.[1]

The technique of calculating future manpower needs in the production sphere is basically different. The first distinction concerns the approach towards appraisal of current requirements which is the starting-point for an assessment of prospective needs. The ascertainment of requirements for the base year must not be confused with an inventory of the available high-level manpower—very important though it is. Whereas only graduates are accepted for the professions of teaching and medicine, in the production sphere a varying share of jobs for which high-level qualifications are normally required is performed by manpower with lower qualifications or by skilled and experienced workers. In Soviet terminology these men are called 'practitioners'. The proportion of practitioners was fairly high in the early stages of industrialization and it is still considerable in some industries of the U.S.S.R., for instance, their share in the total number of jobs which ought to have been filled by graduates with higher and secondary vocational degrees amounts to more than 40 per cent. On the other hand, it may happen that a limited number of graduates hold jobs for which no higher or even secondary educational qualifications are required. For these reasons the criterion used in assessing the high-level manpower requirements for the base year in centrally planned economies is not the number of graduates from higher and secondary educational

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1. For further details see *Planirovanie raskhodov na socialno-kulturnie meropriyatia* (Planning allocations for social and cultural sectors), Moscow, 1962; and also V. G. Kostakov: 'The Main Principles of Assessing Prospective Requirements for Graduates' in *Planirovanie potrebnosti narodnogo khozyaistva v specialistakh* (Planning high-level manpower requirements for the national economy), Moscow, 1959, pp. 66-98.

establishments available in the country, but the actual number of jobs to be filled by these categories of manpower. It is in relation to the requirements of the base year, derived as described above, that an additional requirement for high-level manpower is calculated.

To compute these requirements in both productive and non-productive areas of activity the following data are used in centrally planned economies: plans for the increase of production and cultural development; staff schemes and staffing norms; list of jobs to be filled by high-level manpower; statistics of the past, present and projected number of graduates with higher and secondary qualifications by occupations.

Plans for increasing production and social overhead capital are analysed from the point of view of high-level manpower requirements. The end of such analysis is to take into account factors that increase or decrease total requirements in high-level manpower and affect the correlation between the two main groups within this category of manpower.

The *staff scheme* provides a list of jobs, broken down by all categories of manpower and by occupations, which are essential for the normal functioning of a specific enterprise or service. The staff scheme is set up on the basis of a management model for each particular type of production unit or social service. This model includes the total number of jobs, organizational structure (administration, production department, drawing office, etc.) and placing of cadres throughout the enterprise. The basic principle underlying the management model is the economy of human resources, that is, achieving maximum efficiency with minimum staff. This is, of course, an ideal and the actual administrative and organizational structure can only try to reach it as nearly as possible.

The size of the staff is fixed in relation to the total amount of work to be done and to the workload per staff member. It is important therefore to choose the right yardstick to measure the workload in general and that of high-level manpower in particular. There used to be a tendency to consider the relationship between graduates and the total number of the staff as a universal yardstick. This is certainly a gross over-simplification. In many instances the amount of capital equipment looked after by each specialist or the cost of research and design (for scientific and research establishments) is a more appropriate yardstick. As a general rule, preference must be given to such yardsticks as can measure the workload of different categories of manpower in the most direct manner possible.

The major single element in calculating the number of jobs is thus establishing a normative workload per person in each occupation.[1] This indicator, in turn, allows the working out of the normative staff schemes for enterprises, institutions and organizations which have common characteristics. The normative staff schemes do take into account, of course, the scale of production or the scope of activities for non-productive institutions (number of places in cinemas, size of museums, etc.). The norms naturally reflect current practice and existing relationships but they are not at all mere averages. Based upon advanced cases they provide an indication as to what will be a typical situation in future for the whole industry or economic sector. They have thus an important stimulating effect on planners. As the productivity of labour grows, norms are continuously revised.

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[1] For detailed discussion of the subject see: I. A. Lyasnikov: *Podgotovka kadrov dlya promishlennosti* (Educating and training cadres for industry), Moscow, 1954.

Calculating the necessary number of jobs in accordance with the normative workload per person enables detailed identification of requirements for different categories of manpower. The ultimate aim of the staff planning work is determining the share of high-level personnel in the total staff of an enterprise which must be reflected in the list of jobs for high-level manpower.

The list of jobs to be filled by high-level manpower expresses directly the requirements of a production unit or a social service for graduates from higher and secondary levels of the educational system. It contains the title of the job, a brief job description, profession, index number of the profession, educational level (higher or secondary specialized degree). The most difficult task is to determine what professional qualification is required to fill a specific job. In some cases it is enacted in legislation. For instance, teachers from the fifth to the eleventh grade and doctors must have a university degree or its equivalent. For most of the remaining jobs complexity of function is the general criterion for determining the educational level of the professional qualification.

Jobs requiring a broad scientific or cultural knowledge and responsibility for independent decision-making of a technical or economic nature must normally be filled by graduates with higher educational degrees. Graduates with secondary specialized diploma are entrusted with less responsible jobs of management and direction in which decision-making is called for within a well-defined framework or terms of reference. The application of these general principles varies in different sectors and industries. It involves naturally an element of judgement and it is important that any possible underestimate or overestimate of the educational and professional qualification be reduced to a minimum as it would mean a net waste of human resources from the standpoint of society. Here comes the normative staff-scheme which is taken as a guideline.

A scientifically defined professional qualification system is also one of the basic tools in assessment of manpower requirements. A uniform list of professions serves as a basis for drawing up the lists of jobs to be filled by graduates throughout the national economy and for elaborating curricula of higher educational establishments. The advantage of such a uniform list is that it makes it possible to relate directly professional qualifications to educational level with a degree of precision sufficient for practical purposes. It makes superfluous a very complex and tricky conversion of one to another which otherwise is necessary for the purpose of manpower assessment.

The first such system in the U.S.S.R. was worked out in 1930 when the staff-normative method in its simplest form was first applied. Its main inconvenience was too high a degree of differentiation. This deficiency was soon overcome and by 1935 the total number of occupations was reduced from 950 to 275.[1] At present the uniform list of professions includes more than 300 items for higher education and about 360 for secondary specialized education. The number of occupations is continuously revised as progress in modern technology calls on the one hand for larger grouping and on the other for further differentiation. In the year of 1957 alone, for instance, twelve additional occupations were added to the existing number of higher educational curricula in order to meet the requirements of the nuclear energy application to the national economy. Progress in cybernetics, electronics, biochemistry, nuclear physics, jet propulsion, and other advanced branches of science and technology calls for constant overhauling of the classification system. Continuous methodological research is needed to keep the classification system abreast of new developments in science and technology.

Requirements for high-level manpower are assessed 'vertically' by individual enterprises, agencies and ministries, and 'horizontally' by *sovnarkhozy* (economic regions) and Union Republics. They are all finally compiled and analysed at the U.S.S.R. Gosplan (State Planning Committee) with the collaboration of the U.S.S.R. Ministry for Higher and Secondary Specialized Education. The assessment of total requirements for high-level manpower provides the planners with data on the global or absolute demands for graduates from higher and secondary educational institutions. Once this data has been established calculation of additional demand becomes the next step. It is this additional demand that most interests the educational planners whose task eventually it will be to provide the national economy with the skills it lacks.

Computing of an additional demand by professional groups takes into account the following three main elements:

1. Increase in the number of jobs due to growth of output and alteration in technological patterns of production.
2. Compensation for losses due to withdrawals from the labour force.
3. Partial replacement of practitioners by graduates with diplomas.

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[1] P. P. Litviakov, 'Problems of assessing manpower requirements and planning their education and training at different stages of socialist development', in *Planirovanie potrebnosti narodnogo khozyaistva v specialistakh*, Moscow, 1959, pp. 47-55.

The first of these elements embraces quantitative changes (expansion of existing enterprises and building up of new ones) as well as qualitative changes (technological progress at large and improvement in organizational structure) which have a direct bearing on the required number of graduates with higher and secondary specialized degrees.

The second element embraces two kinds of losses: those from death, disability, retirement—called natural losses; and those due to transfer from one economic sector to another—military service, withdrawal for family reasons, resumption of studies, and so on. They have a different impact on additional manpower requirements depending on the size of the territorial unit for which they are viewed. On a nation-wide and Union Republic scale, only natural losses count. Withdrawals for other reasons do not play a big part here since they are more or less balanced by re-entry into the labour force from the same sources—household, army, education system, other areas of activities. From the standpoint of an individual enterprise, however, or a small territorial unit, these opposite movements may not compensate one another and, consequently, may result in an imbalance. For this reason, short- and medium-term forecasting of manpower requirements of a production unit, service or a small economic region must necessarily take into account all kinds of losses, while long-range forecasting on the Union Republic scale may consider only natural losses. It is estimated that annual losses for all reasons amount on an average to 3-4 per cent for graduates with higher educational degrees and to 4-5 per cent for graduates with secondary specialized diploma.[1] The difference is mainly due to withdrawal for continuation of studies and partly to a bigger proportion of women who withdraw, for family reasons, at a higher rate.

The third element reflects the continuous rise in standards applied to managerial and technical personnel whose functions—for lack of trained high-level manpower—are performed by practitioners. This situation obviously cannot be changed overnight, but the need for steady replacement of practitioners by graduates must be taken into account in calculating additional manpower requirements. The problem of replacement is partially solved by encouraging practitioners themselves to obtain university or secondary specialized diplomas by correspondence and evening courses. Material and prestige incentives are widely used for this purpose.

The assessment of additional manpower requirements through the staff-normative method yields better results than any other method since it is based directly on specific plans for economic and social development and ascertains manpower needs in terms used in the education system. The limitation of the method, however, is that it cannot be usefully applied to the assessment of manpower requirements other than short-term and medium-term. It does not allow going beyond a five to seven years' period for which detailed plans exist and precise ways and means of implementing these plans are known.

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[1] See particularly N. G. Nozhko, 'Some Problems of Planning Education and Training of High-Level Manpower' in *Vestnik vishey shkoli* (Higher education messenger), No. 4, 1957, p. 18.

Combined method

Forecasting manpower requirements for fifteen or twenty years ahead is achieved through a combination of the staff-normative method and the method of manpower ratios. For the seven-year period, requirements are computed by means of the staff-normative method; for the remaining eight to thirteen years they are ascertained by means of coefficients of saturation, and the results of both operations are summed up. For the entire twenty-year period the additional requirements are assessed by levels of education and groups of professions rather than by individual professions. Similarly, needs are ascertained not by individual production units, institutions and services, but by big economic and social sectors and by Union Republics. The coefficients of saturation of the total labour force by high-level manpower are calculated in relation to 1,000 employed or to the amount of capital equipment or else to the physical volume of output. These ratios are based, of course, on the anticipated correlations in technologically advanced enterprises which are going to be built up during the seven-year plan period and for which at the moment of calculation designs are already available. Even so it is realized that the data obtained is conditional and subject to further revision in the light of technological advance. Continuous research is going on in all centrally planned economies to improve the accuracy of long-term forecasting technique which is still not entirely satisfactory.[1]

The method of assessment of prospective manpower requirements according to the degree of saturation of the totally employed labour force by high-level and middle-grade skills has essentially four stages:

1. Estimating the totally employed labour force for each year of the period going beyond the 5-7 year horizon.
2. Breaking down the total by the main areas of activity.
3. Assessing the share of high-level and middle-grade manpower in each of these areas.
4. Forecasting the additional demand for high-level manpower, that is, the number of graduates to be turned out by the educational system.

[1] I am greatly indebted to Dr. K. G. Nozhko for his kind permission to quote some factual data and formulae from the study on 'Methods of Estimating the Demand for Specialists and of Planning Specialized Training in the U.S.S.R.' which will be published shortly by Unesco.

The first operation is wholly based on the demographic forecasts and here the quality of statistical services plays a crucial part. To start with, the total active population is estimated for the whole period covered by the prospective plan (fifteen to twenty years) and for each individual year; then the total number of all students—who obviously do not participate in the production of goods and services—are assessed by age groups. By subtracting from the total active population the total number of students one arrives at an estimate of the stock of labour force in the country for every year within the twenty-year horizon.

The second stage is based on prospective plan targets or control figures which serve as guide-lines for breaking down the total labour force by economic sectors and spheres of activity. It is essential for the sake of full employment that forecasts of manpower requirements for individual sectors be consistent with coefficients relating future manpower resources to production targets. Once this is ensured it is possible to proceed to the next stage which deals with high-level and middle-grade manpower proper.

The purpose of the third stage is to estimate global requirements in graduates from higher and secondary education on the basis of the adjusted current share of these categories of manpower in the total stock of manpower, for a specific area of activity, an economic region and Union Republic. At present the ratio of graduates from higher and secondary education per 1,000 employed in the U.S.S.R. varies from 20 in industry and 4 in agriculture and forestry to 105 in health service, 281

Table 15 *Ratio between graduates from higher and secondary specialized educational establishments engaged in the U.S.S.R. economy*[1]

Occupation	Number of graduates with secondary specialized diploma per 100 graduates with university or equivalent degree		
	On 1 Jan. 1941	On 1 Dec. 1957	On 1 Dec. 1960
Engineers and technicians	110	150	170
Agronomists, veterinary, forestry workers	130	160	160
Economists, statisticians, trade experts	60	190	200
Medical workers	270	280	300
Teachers, librarians, liberal professions	180	80	80
Total average for all occupations	160	140	150

[1] *Vishee Obrazovanie v SSSR* (Higher education in the U.S.S.R.), Moscow, Central Statistical Office, 1961, p. 51.

in education and 377 in science. Another ratio which is essential for the assessment of future needs correlates the number of graduates with university degree or its equivalent to those with secondary specialized diploma. The dynamics of this relationship for the past twenty years in the U.S.S.R. may be seen from Table 15.

It may be noted that although the flow of graduates from higher educational establishments is steadily increasing—the annual additions run at more than 300,000 a year—the ratio between graduates with higher degrees and graduates with secondary specialized diplomas, with notable exception of the education and liberal professions, is changing in favour of the latter. This reflects an over-all levelling-up of the educational standard of the working population. The ratios and coefficients of saturation are to be adjusted in the light of anticipated trends in the productivity of labour and the foreseeable effect of technological progress on the correlation between different categories of manpower.

The following formula is in use in Soviet educational planning for expressing the correlation between the annual number employed and the growth of labour productivity:

$$N_{\mathrm{P}} = N_b \frac{C_{g^1} . C_{g^2} . C_{g^3} \ldots C_{gn}}{CX_{p^1} . CX_{p^2} . CX_{p^3} \ldots CX_{pn}}$$

N_{P} = the number of employed in a given year;
N_b = the number of employed in the base year;
C_g = the coefficient of increase in gross output for each year covered by the plan;
CX_p = the coefficient of the growth of labour productivity in terms of output per person employed in the year concerned;
n = the number of years covered by the plan.

The fourth stage is the forecasting of additional demand proper, that is, the actual number of graduates to be trained by the educational system. It is derived by subtracting from the global demand for skills the available number of graduates with due account taken of all factors affecting the increase and decrease of the latter. Mathematically the availability of the graduates for any given year of the period covered by the plan may be expressed in the following formula:

$$N_{\mathrm{P}} = N_b \,.\, C_{i^1} . C_{i^2} \ldots C_{in}$$

where:

N_{P} = the number of graduates at the end of a given year within the planning period;
N_b = the number of graduates in the base year, e.g. by the end of the last year for which graduation is predetermined by the enrolment in previous years;

C_i = the coefficient of the increase in the number of graduates in each year;
n = the number of years covered by the plan.

Since the method of assessing requirements for graduates from higher and secondary educational establishments by saturation deals with a relatively small number of interdependent ratios and coefficients, they may be expressed in mathematical formulae which can be handled by electronic computing devices. This is undoubtedly an asset of this method, though it must be noted that in the literature on the subject opinions diverge as to the extent of the applicability of mathematics to manpower analysis and forecasting.

All the three methods described above pay due consideration to the regional aspect of manpower requirements, that is, to the distribution of manpower over the country, the general tendency being to locate educational and training facilities closer to the eventual centres of employment. In a country like the U.S.S.R., where the distances are tremendous, preoccupation with this aspect of educational planning is only natural.

Administrative aspects of educational plan formulation

Once the additional demand for graduates has been assessed it is possible to proceed to the actual drawing-up of the plan for educational expansion. This implies calculation of additional enrolments in all levels and branches of education broken down by annual targets and by curricula, a corresponding expansion of educational facilities, increasing teaching staff and calculating financial allocations required. Each of these elements may well be treated as a separate subject for study, and they are therefore not considered here. What is worth while to note, however, is that an initial assumption may prove to go beyond material possibilities and the computation will have to be done again and again until educational targets have been adjusted to available resources and geared into the over-all development plan. The consistency of the educational plan can be achieved only by successive approximation.

The draft educational plans in the U.S.S.R. are elaborated by Union Republics and Ministries and agencies responsible for vocational education. They are helped in this task by the educational institutions themselves. The draft educational plans are assembled by the U.S.S.R. Gosplan which, in co-operation with the U.S.S.R. Ministry for Higher and Secondary Specialized Education, draws up a concerted plan for development of education and culture. It is then broken down again by Union Republics and by groups of curricula, as well as by types of education (daily, evening, extra-mural). The U.S.S.R. Council of Ministers approves global figures for admissions and graduations only, leaving it to Union Republics and appropriate ministries to break it down by curricula. Special attention is paid to the content of education from the point of view of practical utility in order to strengthen the links between education and life.

Though manpower considerations, as was stated earlier, are far from being the only criterion determining the scope of educational effort in centrally planned economies, and social and political factors are indeed regarded as of major importance, they are certainly those that most attribute to education its characteristics of a powerful driving force in economic development.

Chapter VIII

Statistical analysis and quantification in educational planning

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If national statistical services were well developed the economist and educator could utilize much useful data for educational planning. Unfortunately the necessary data are generally lacking in whole or in part and it falls upon the statistical analyst to derive or estimate relevant statistical aspects of the educational, economic and social systems without which any educational plan would lack reality.

Quantification of plans, moreover, is not merely the mechanical process of estimating and projecting numbers, it is the translating of educational goals into numerical targets. From these targets alone the reality, or lack of it, of the goals can be assessed, reviewed and modified. One of the basic aims of statistical analysis is the development of analytical models which indicate the interrelationships involved in alternative approaches in the implementation of plans.

This chapter sets out briefly to identify and describe some approaches and methods that can be used to achieve these ends. The first section discusses some of the measures that can be derived to describe and project educational needs and the desired balance of the educational system. The second section deals with the numerical implications of possible shifts in enrolment. The third section outlines a method for the quantification of educational plans with an example from the African plan of educational development. The fourth section deals with costing educational plans and uses the example of the Latin American experience while the last section sets out some brief conclusions.

Derived measures of needs for facilities and balance of the educational system

School statistics generally consist of numbers of pupils, teachers and institutions classified by level and some types of education. In order to bring these numbers into relation with the broader social system in which the educational system operates some derived measurements are necessary. These can be either descriptive or projective but are designed to demonstrate the interrelationship between educational, demographic, economic and social statistics. For example, within the educational system itself the relation between teachers and pupils is commonly shown as the pupil-teacher ratio. The number of students of given ages as a proportion of the population of those ages is another basic derived measure, the school enrolment ratio. Some of these measures are easily obtained even where statistical services are not well developed while others are based upon highly sophisticated data not readily available and may in themselves be composed from estimated or derived data. Their use depends upon the specific problem at hand of course.

One often hears the term 'school-age population' in reference to the development or desired development of a school system. Unfortunately, the actual school-age population is known only for relatively few school systems. This does not alter the fact that the most basic summary measure of a school system, at least insofar as education as a human right is concerned, is the proportion of the school-age population enrolled in school. This proportion is very often used as a specified goal in itself. Actually, when applied to a particular school system at a particular time it is a descriptive measure alone, while it is a comparative measure of a type of development when applied to several school systems or over a period of time. School systems do not recruit students from the child population except in the first year of primary school. The measure describing total enrolment for a given level of education as a proportion of the school-age population is the result of successive waves of children entering school. This is extremely important for the strategy of planning for it sets severe limits upon possible quantitative increases for some levels or types of education. As noted above, the precise data needed are more often lacking than not—in this case the enrolment by single years of age and grade—and the analyst must be prepared to work with what is readily at hand and derive to the best of his ability what is needed.

Census data or estimates of the population, by age, are usually restricted to five-year age groups. The populations most relevant to the three broad educational levels are the 5-14, 15-19 and 20-24 year olds. These data can usually be found within the country or from United Nations publications together with estimates of population growth. If completely unavailable, similar data for contiguous countries can be converted into proportions and these applied to the total population. It should be remembered that the 5-14 year-old population represents a ten-year group while the 15-19 and 20-24 year-olds are five-year groups.

The average duration of schooling at the various levels of education does not usually conform to these five-year age groups and the population base must be adjusted accordingly in order to yield an estimate of the school-age population. If, for example, the primary school course is of six years' duration, the primary school-age population, theoretically, would be a six-year age group. This is theoretical because all students do not enter school at the same time nor spend the same number of years in school. Inevitably, in a system with universal primary education and no drop-outs the enrolment would be greater than the 'normal' age-duration cohort population. In the absence of detailed data, however, it has been the practice to adjust the known population cohort by the average duration of the school course to obtain an estimate of the school-age population for each level. Thus for a six-year primary school course this population would be estimated as six-tenths of the 5-14 year-old population. This exercise is similar for the second and third levels of education, bearing in mind that the 15-19 and 20-24 year-olds are five-year groups. The rough adjustment of age group in years assumes parity between each single year age within the group. This parity, of course, does not exist and if information about the age distribution within each age group is available a more refined estimate may be obtained. In the absence of this the derived 'enrolment ratio' for each level, adjusted by duration of schooling, is obtained by the formula:

$$E.R._1 = \frac{E_1}{\frac{D_1}{10}(P_{5\text{-}14})} \qquad E.R._2 = \frac{E_2}{\frac{D_2}{5}(P_{15\text{-}19})} \qquad E.R._3 = \frac{E_3}{\frac{D_3}{5}(P_{20\text{-}24})}$$

where:

$E.R.$ = enrolment ratio;
E = enrolment;
D = average duration of the school course in years;
P = population of age group specified;
1 = first (primary) level of education;
2 = second (secondary) level of education;
3 = third (higher) level of education.

The 'enrolment ratios' thus derived have the advantage of being constructed from the kind of basic data that is almost universally available —over-all school enrolment by level, average duration of the school course by level and population by five-year age groups. These derived ratios also have serious shortcomings that may be partially offset by the incorporation of information that may be available. These ratios are merely the expression of the school enrolment as a proportion of the estimated relevant age group. It is in the estimation of this relevant age group that the most serious deficiencies occur. The six-year age group 6-11 is rarely if ever exactly six-tenths of the ten-year age group 5-14. Similarly, it is common to find overlapping of ages within different years of study as well as repeaters. These errors generally have the effect of underestimating the school-age group and thereby overestimating the 'enrolment ratio' because of this overlapping of students, both those younger than the usual beginning age and older than the usual terminal age. In well-developed school systems, especially at the primary level, it is common to obtain ratios in excess of 100 per cent using this method. Furthermore it is at the primary level, the only level that 'recruits' its students from the population, that this measure is most crucial. At the second and third levels this measure is purely descriptive while at the primary level it may actually be the enrolment target. One should utilize what information is available in the particular country, at least in estimating the primary school-age group. Thus, if the population by single years of age is known it will result in a much more accurate estimate of the school-age population. If information about birth and survival rates are available or the changes over the past decade are known, the child population by single years of age can be estimated by constructing a rough model. Further, if something is known about average repetition this factor can be added to the average duration of the course.

The 'enrolment ratios' for each level of education are valuable for analysis because they relate enrolment to the enrollable population. When expressed in terms of a 'pyramid' they indicate the relative quantitative development of each level, in a sense adjusted to the population of 'enrollables' and the duration of the course in each level of education. The more commonly used enrolment pyramid is the over-all distribution of students by level, which indicates the quantitative differences between levels, but it can be misleading due to the absence of any population factor, in other words, it gives no indication of non-students.

The advantage of the enrolment pyramid is that the only data required are enrolment by level. A simple additional possible measure from these data is to adjust each part of the pyramid by the average duration of the course. If the primary course, for example, is twice as long as the secondary course, the proportion of primary students would, all other things being equal, be twice that of secondary students. This should be adjusted if a measure showing the relative quantitative development of the different levels of education is desired.

The unadjusted proportions for each level are easily determined by the formula:

$$P_1 = \frac{E_1}{E_{\mathrm{T}}} \qquad P_2 = \frac{E_2}{E_{\mathrm{T}}} \qquad P_3 = \frac{E_3}{E_{\mathrm{T}}}$$

The proportions adjusted by the duration of the course are:

$$P_1 = \frac{D_{\mathrm{T}}}{D_1} \cdot \frac{E_1}{E_{\mathrm{T}}} \qquad P_2 = \frac{D_{\mathrm{T}}}{D_2} \cdot \frac{E_2}{E_{\mathrm{T}}} \qquad P_3 = \frac{D_{\mathrm{T}}}{D_3} \cdot \frac{E_3}{E_{\mathrm{T}}}$$

where

P = proportion of enrolment;
E = enrolment;
D = average duration of the school course in years;
1 = first level of education;
2 = second level of education;
3 = third level of education;
T = total of all levels of education.

These proportions, of course, are intended for comparison of quantitative development between levels of education only and will not describe a pyramid since their addition will not equal 1.00 or 100 per cent. If they are to be added this must be done numerically and then each proportion expressed as a percentage of the total of the proportions.

Educational planning in specific cases may be concerned with the analysis of the existing and alternatives regarding changes in the quantitative distribution or balance between different types of education within the same level. This type of analysis is usually confined to the higher levels of education, i.e., enrolment by field of study, and is most likely related to the educational output. All too often in less developed systems data concerning output (graduates or leavers at various stages of completion of the course), over a period of time is insufficient as a basis for projecting future output due to rapid changes which may have taken place, i.e., the establishment of new schools, which, in the beginning may contain enrolment but no graduates. Future output, at least for a period covering the duration of the course of study, can be estimated from enrolment. In comparing educational output from enrolment of different courses of study special care must be taken in accounting for the variations in over-all wastage and the average length of courses. Obviously, identical enrolments and over-all wastage will result in a markedly different annual output of graduates if one course has a duration considerably different from another. Over-all wastage (the proportion of those starting who do not complete the course) exerts a similar effect upon output. Just as annual output can be estimated from enrolment so can required enrolment be estimated from desired output. These quantities can be determined from the formulas:

$$O_A = \frac{E_T(1-W_{\mathrm{T}})}{D_A} \quad \text{and} \quad E_T = \frac{O_A D_A}{1-W_{\mathrm{T}}}$$

where:

O_A = average annual number of graduates (or other educational output criteria);
E_T = total enrolment in that level or type of education;
W_T = over-all wastage; the proportion not finishing of those beginning;
D_A = average duration of the course in years.

Depending upon the information available this formula, or algebraic variations of it, can be of much use in determining future quantities of students, for example, needed to produce desired quantities of graduates. The quantitative effect of changes in the wastage rate can also be demonstrated and, indeed, throws light upon the importance of attacking the wastage problem. In this context it can be seen that the output of a given level and/or type of education can be significantly increased with no increase in enrolment through a modification of the wastage rate and/or the duration of the course.

Quantitative and qualitative implications of shifts in enrolment ratio pyramid

In a very real sense when an educational system is planned to undergo rapid quantitative increase 'from the bottom up', the educational system itself can be a major consumer of its own graduates. In these terms the 'input-output-input circle' is investment in infrastructure. The system itself will produce teachers which, in turn, will be absorbed into the system. This reasoning will also apply to other personnel such as school supervisors, inspectors, etc., but, quantitatively, the production of teachers is of major concern. The degree of 'effort' devoted by the system to supplying itself varies, naturally, with the rate of growth of the system, among other things. The production of teachers is normally one of the most limiting factors associated with quantitative and qualitative growth of the system. Quality of teaching is strongly related to the amount of teacher training possessed by the teacher as well as the number of pupils to be taught by the teacher. When certain 'norms' are established concerning these two factors, the 'bottleneck' to expansion caused by the lack of teachers or to under-training can be analysed and various ways of meeting it demonstrated.

Generally, as a minimum, it is held that a teacher at a given level of education should have been trained, at least partially, at the next higher level. Thus primary school teachers should have, in addition to a primary school education, teacher training at the second level of education and second-level school teachers should have some teacher training at the higher level or equivalent. Even in a stable system, a certain number of teachers are needed each year to replace those lost through retirement, discharge, illness or death. If sufficient data were available one could estimate the number of teachers needed for replacement on the basis of the separate factors involved; the number each year who will reach retirement age, the age-specific death and morbidity rates, etc. In a system planned for rapid growth the replacement factor becomes less important than the demand for teachers for additional pupils. It may thus suffice to determine a global service life, by level and perhaps type of education. This can usually be estimated from a general familiarity of the problem and some 'rule of thumb' limits can be used. The service life is generally shorter among higher qualified teachers at the upper levels since they enter teaching later in life. The proportion of females among the teaching force will affect the service life since they are more apt to leave, at least for a period of time, due to pregnancy and the rearing of infants. An important factor affecting the loss through transfer to other occupations is the relation of teachers' salaries to those outside teaching for similar levels of qualification, and the general demand, outside teaching, for educated manpower in various fields, etc. If the average service life were 25 years, for example, the annual needed replacement would be 4 per cent; if it were 20 years, annual replacement would be 5 per cent and so forth.

The need for additional teachers can be calculated on the basis of dividing the enrolment increment by the proposed pupil-teacher ratio. Thus the number of new 'classes' is calculated. Of course a change in the pupil-teacher ratio from that existing may result in a demand for new teachers for existing enrolment or an excess of 'old teachers' available for new students. If these calculations are made for a period, aggregating a number of years, the yearly number needed must be phased to coincide with the yearly increase in the number of 'classes'. The enrolment in teacher training institutions necessary to produce the required number of teachers can be calculated from the formula given above. Similarly, the number of teachers needed in teacher training institutions can then be calculated.

It is evident that careful analysis of this type will throw light on the existing and developing bottlenecks to development within the educational system itself. This will aid in proposing alternative targets and adjusting other variables affecting teacher output and, importantly, focus attention on the possible need for outside personnel in crucial areas at crucial periods of the plan. This analysis can be effected by constructing series of models based on alternative hypotheses relevant to the plan under formulation.

Quantified models of educational plans

Quantified models are usually of several types, depending upon the needs

Table 16 *A model educational pyramid*

(a) Total population (hypothetical)		1,000,000
Primary or first-level education		
(b) Primary school-age population estimated at 15 per cent of total population		150,000
(c) Enrolment at the first level of education		150,000
(d) Ratio of enrolment at the first level of education to the relevant age group		100%
(e) Number of children to enter first-level education each year (in a six-year school, constant cohorts)	$\frac{150{,}000}{6} =$	25,000
(f) Number of children to complete the six-year course each year (assuming 20 per cent over-all wastage)	25,000 — 5,000 =	20,000
Second-level education		
(g) Number of children selected annually for entrance to second-level institutions (30 per cent of 20,000)		6,000
1. Entrants to secondary general schools of six years' duration (one-third of 6,000)	2,000	
2. Entrants to all other types of institutions (two-thirds of 6,000)	4,000	
Note. These institutions will be composed of intermediate schools (three-years' duration), lower-stage (three years' duration) and higher-stage (six years' duration) teacher-training schools, and lower-stage (three years' duration) and higher-stage (six years' duration) vocational and technical schools.		
(h) Total enrolment at the second level of education on the assumption that, of the 4,000 pupils who go to schools other than general secondary of six years, 3,000 pupils will be enrolled for an average of three years, and 1,000 for an average duration of six years.	2,000 × 6 = 12,000 3,000 × 3 = 9,000 1,000 × 6 = 6,000	27,000
(i) Second-level school-age population estimated at 12 per cent of total population		120,000
(j) Ratio of enrolment at the second level of education to the relevant age group	$\frac{27{,}000}{120{,}000}$	23%
(k) Number of children each year who will complete a six-year second-level general school course (allowing for an over-all wastage of 15 per cent)	2,000 — 300 =	1,700

Higher or third-level education

(l)	Pupils who will be selected each year for higher education (about 20 per cent of those completing the six-year secondary general plus some graduates of upper stage teacher-training and vocational and technical institutions)	375
(m)	Total enrolment at the third level of education (average duration assumed at four years, in-course wastage not considered)	1,500
(n)	Third-level school age population estimated as 7.5 per cent of total population	75,000
(o)	Ratio of enrolment at the third level of education to the relevant age group $\frac{1,500}{75,000}$	2%

of the situation. Often they are used to quantify certain specific stated targets or goals at a specified time. Once the 'model' educational system is established, a 'numerical picture' is established which, when compared with a similar numerical description of the existing situation can demonstrate the magnitude of the change envisaged. The phasing of the change from the existing to the desired educational situation can then be carried out. Sometimes there are definite goals regarding the phasing itself and these can be 'tested', as it were, against the final target. Often there are not, and the phasing, in essence, consists of establishing a system of interim targets. The following illustration, using a hypothetical population, is based upon one of the early regional exercises of this kind, the Plan for African Educational Development adopted by the Conference of African States at Addis Ababa.

The targets adopted were set up in the form of an enrolment ratio educational pyramid to be reached in 1980 (twenty years time). These decisions were stated as follows:[1]

1. Primary education of six years' duration will be universal, free and compulsory. Enrolment at the primary stage will thus be 100 per cent.
2. Wastage in primary education in Africa is very high: of every 100 children who enter the primary school it is estimated that only about 40 complete the course. It is assumed that intensive efforts would be made and that this wastage would be greatly reduced. It is thus anticipated that out of every 100 children who enter the primary school, 80 children will finally complete the primary course.
3. Of the children who thus complete the primary school course, 30 per cent will be selected for admittance to second-level institutions.

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[1] *Final Report, Conference of African States on the Development of Education in Africa, Addis Ababa, 15-25 May 1961*, Unesco/ED/181.

One-third of these will be admitted to schools of general secondary education which have a six-year course. The remaining two-thirds will be admitted to schools offering a wide variety of courses: some schools will provide a general education over three or four years, with or without some vocational or technical bias; some will provide teacher-training courses of two, three or four years' duration; some will provide further technical and vocational courses of one to three years' duration for pupils who have completed about nine years of school. It is also assumed that wastage at the secondary level, which is also very high at present, would be reduced to 15 per cent; thus of 100 children entering the six-year general secondary school, 85 will be expected to complete the course.

4. Of the children who complete the six-year general secondary course, 20 per cent will proceed to higher education. Some would be admitted directly to a university; others may first follow a pre-university course; a large number would be admitted to two-year vocational and technical courses of a higher type which would be terminal in character.

A model educational pyramid can be constructed based upon a hypothetical population of 1 million (see Table 16). The relative age distributions based upon population projections for age groups adjusted for the duration of the course were converted into proportions for this exercise.

In order to convert this model educational pyramid for 1980, which can be expressed, in terms of the enrolment ratios, as 100 : 23 : 2 (the comparable 1960 pyramid estimated at the time of the Conference was 40 : 3 : 0.2) into a quantitative model of the educational system certain other decisions were made regarding such things as the pupil-teacher ratio, the proportion of school inspectors, qualifications of teachers, etc. Once the quantitative model of the desired 1980 school system is put alongside the 1960 situation certain decisions regarding the phasing of the transition became necessary. This kind of exercise explicitly states some of the interdependences within the school system itself and establishes, so to speak, the necessary numerical requirements. For illustrative purposes some of the data and explanations of calculations used at the Addis Ababa Conference are shown in Table 17. New population projections and enrolment data have already led to several important modifications of these data. Higher education in Africa was the subject of a special conference which elaborated and modified the general targets set at Addis Ababa and the illustration here concerns only first and second-level education.

These figures which give an indication of the quantitative consequences of the decisions taken at the Conference and the phasing of one period are only fragmentary. One of the important decisions of the Conference pertaining to the implementation of the plan was that primary school enrolment would be increased annually by the enrolment of an

Table 17 *Statistics and details of calculations for educational targets*

	First year 1961	1965	1980
(a) Total estimated population	172,400,000	182,300,000	221,900,000
Primary education			
(b) Estimated school-age population	28,200,000	29,800,000	32,800,000
(c) Estimated enrolment at the primary level	11,600,000	15,300,000	32,800,000
(d) Enrolment ratio	41.1	51.3	100.00
(e) Pupil-teacher ratio	41	45	35
(f) Number of teachers required	283,000	340,000	937,000
(g) Estimated number of additional teachers required in the year indicated for:			
1. Replacement	20,000	22,000	45,000
2. Additional enrolment	3,000	21,000	31,000
Total	23,000	43,000	76,000
Second-level education			
(h) Estimated enrolment in:			
1. General:			
Academic (6-year)	542,000	1,056,000	2,625,000
Intermediate (3-year)	136,000	264,000	1,361,000
2. Vocational and technical:			
Lower stage (3-year)	104,000	251,000	984,000
Higher stage (6-year)	35,000	84,000	563,000
3. Teacher training:			
Lower stage (3-year)	75,000	144,000	93,000
Higher stage (6-year)	12,000	35,000	279,000
Total	904,000	1,834,000	5,905,000
(i) Pupil-teacher ratio	18	20	19
(j) Number of teachers required	50,000	92,000	311,000
(k) Estimated number of additional teachers required in the year for:			
1. Replacement	3,500	5,300	15,000
2. Additional enrolment	700	16,000	10,500
Total	4,200	21,300	25,500

additional 5 per cent of the beginning school-age group (normally, the six-year-olds). This increase was converted into the projected increase of the entire primary school enrolment ratio and thus (d) was calculated. Line (d) was multiplied by line (b) to yield line (c) the desired enrolment. This, of course, was actually done for each year. It will be noted that in order to supply the teachers for this expansion it was decided to raise the pupil-teacher ratio till 1965 and then to lower it. Thus lines (c) and (i) were decisions of the Conference (starting from observed reality of course) and were used to compute the number of teachers required, lines (f) and (j). It will also be noted that certain assumptions regarding changes in the status of teachers were made. Thus, primary school teachers replacement needs, line (g), was calculated on the basis of an average teaching life of only about 14 years in 1961, increasing to over 15 years by 1965 and to almost 21 years by 1980. The teacher replacement needs for second-level teachers, line (k), was similarly calculated on the basis of a 1961 teaching life of 14 years, rising to over 17 years by 1965 and almost 21 years by 1980. The requirements for additional teachers were calculated by dividing the total number of pupils each year by the proposed pupil-teacher ratio and subtracting the number of replacement teachers. The enrolment in teacher-training institutions, line (h 3), was calculated so that there would be a steady increase in the qualifications of the new teachers produced, as specified at the Conference. Thus, for example, in 1961, of the 23,000 primary school teachers required, practically all would come from second-level teacher-training institutions of the lower stage while a large majority of the 4,200 second-level teachers needed would be coming from higher stage institutions. By 1980, however, only about a third of the 76,000 needed primary school teachers would be produced by lower stage institutions, most of the rest coming from higher stage schools while a large proportion of the required 25,500 second-level teachers would be coming from teacher-training institutions at the higher education levels (use of formulas on page 151).

Costing educational plans

An integral part of quantifying educational models is costing them as well. Just as a quantified model or series of models aids in focusing attention on bottlenecks in real resources and thus helps to set limits within which the planner must work from the standpoint of human capital, a costing model aids to focus attention on the limitations imposed by available financial resources and helps add another level of 'reality' to hypotheses regarding proposed educational targets. It must be emphasized that just as quantifying model educational targets is a technique to aid the educational planner by giving him a tool with which to 'test out' alternatives before he establishes his plan and is not necessarily the plan itself so costing can be used to identify areas of potential deficit and is not an estimate of expenditure. Costing, of course, should be based as closely as possible on information regarding 'normal' factor prices but there are a variety of situations where domestic outlays vary from cost estimates because of such things as foreign aid in kind, voluntary services and other factors. In costing teacher salaries, for example, the existence of a non-permanent group of volunteer teachers would result in a difference between the costs based on factor prices and actual outlay on a standard per-pupil basis.

This scheme presents a method for the estimation of only the monetary costs of resources necessary for an educational programme. Non-monetary costs such as the value of the products (earnings) which students would have produced had they not been attending school are not included.[1] The procedures for estimating such costs differ greatly from those used to calculate required monetary backlogs and the data necessary to estimate them generally are not available in developing countries. For certain types of education the magnitude of these costs may approach that of the monetary costs and therefore cannot be ignored in decisions on the educational plan.

Costing usually is designed to reflect, therefore, potential outlays at factor prices and is thus usually separated into recurring and capital costs, just as is expenditure. Recurring costs are usually calculated on a per-pupil per-year basis but, for certain analyses, especially those concentrated on the output of a particular branch of education, this can be done on a per graduate basis. Capital costs estimates for a given time period coinciding with an educational plan can conveniently be calculated on a per place basis, that is, new facilities needed for additional pupils. The cost of new capital can also be expressed in per pupil units by amortizing the new 'places' constructed. The basic differences between per-pupil recurring and per-place capital costs may warrant some elucidation. Their relationship to each other may indicate much about the rate of growth of the school system but it may also be misleading since they are based upon quite different factors. Recurring costs refer to the running of the existing school establishment; it is paying, so to speak, for the consequences of past capital outlays. The latter, on the other hand, are dependent mainly upon the proposed expansion of the school system and are more in the nature of investment in plant for future additional pupils. Present capital expenditure, of course, will require future recurring expenditure and the capacity of a country to provide for this must figure in the decision regarding the advisability of capital outlay.

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[1] For a discussion of the concept of products or earnings foregone see Theodore W. Schultz, 'Capital Formation by Education', *The Journal of Political Economy*, Dec. 1960, pp. 573-577.

In estimating recurring costs on a per-pupil basis it is advisable to proceed by costing the components involved. Since teacher salaries are the most important component, the 'school class', that is, the teacher-unit, can be used and then adjusted back to a per-pupil basis. At the Conference on Education and Economic and Social Development in Latin America, Santiago, 5 to 19 March 1962, a costing exercise was prepared that may serve as an illustration. The following figures are taken from that exercise which was designed to cost an educational programme for Latin America. Amounts are in U.S. dollars.

First-level education. Recurring costs for a class of forty pupils for one year:

(a) Teacher salary at an average of $90 per month	1,000
(b) General expenses (maintenance, etc.)	120
(c) Welfare: canteen, shoes, clothing, financial aid, etc.	120
(d) Administration and supervision at 5 per cent	70
	1 390
	or about $35 per pupil

It is obvious that familiarity with the particular system will affect the degree to which cost figures will describe outlay estimates. It is also obvious that the conversion of class cost to pupil cost directly depends on the average size of the class. In this example the average number of pupils taught was used to compute the standard cost. It may be desirable, for analytical purposes, to use the average number of successful students —those progressing up the educational ladder. In that case, naturally, the 'clean cost' would be divided by the number completing the course and the standard cost would be higher. Per graduate costing is especially useful for analysing more specialized types of education such as that leading directly to skilled employment.

Capital outlays may also be calculated on the basis of additional class-places. Class costing simply requires dividing the cost of plant and equipment by the number of class units and per place costing requires the further division by the number of places in a class.

First-level education. Capital costs for a class of forty places:

	$
(a) Construction of one classroom, 60 square metres, at $30 per square metre	1 800
(b) Furniture	600
(c) Equipment and supplies	200
	2 600
	or about $65 per additional place

Again, it should be emphasized that the capital costs thus computed refer to additional places for additional enrolment. Naturally, the provision of additional places is based upon the anticipated future need. If it takes a year to provide the places, for example, the outlays for new places needed for the following year must be made during the preceding or building year. In practice it is common to estimate capital outlay for the length of the educational plan period and then apportion the actual expenditure on the basis of construction capacity. The per-place costing method gives an estimate of required expenditure, but it is also useful to have a measure of the per-pupil cost of resources for educational plant and equipment. For new plant and equipment the per-place cost is simply divided by the number of pupil years it will be used. In the above example if each additional place (costed at $65) were to serve twenty years, the per-pupil cost per year would be $4.25. To the extent that existing plant and equipment per pupil is equivalent to that for new places, and costs and length of life are also similar, the per-pupil cost of existing capital will be the same. Where old and new capital differ the average capital cost per pupil will depend on the relative proportions of old and new capital.

If the per-pupil capital cost is to be used to value the quantity of existing school facilities used up per pupil per year, the weighted average capital cost described above is appropriate. If, however, estimates of capital outlays for replacement of plant and equipment are desired, the capital cost per pupil of new facilities must be employed.

There is considerable variation in educational costs of different types

Table 18 *Second-level education. Recurring costs for a class for one year*

	General	Vocational and technical	Teacher training
Distribution of pupils	50%	40%	10%
Pupils per teacher	25	20	25
	$	$	$
(a) Teacher salary	3,000	4,200	3,600
(b) General	200	800	300
(c) Welfare	300	600	600
(d) Administration and supervision	100	100	100
	3,600	5,700	4,600
Per pupil	144	285	184

Or about $200 per pupil over-all second level

Table 19 *Second-level education. Capital costs*

	General	Vocational and technical	Teacher training
Number of places	25	20	25
	$	$	$
(a) Construction at $50 per square metre	5000 (100 sq.m.)	7000 (140 sq.m.)	5000 (100 sq.m.)
(b) Furniture	600	600	600
(c) Equipment and supplies	200	500	300
	5800	8100	5900
Per additional place	232	405	236

Or about $300 per additional place over-all second level

of courses within the second and third levels of education and more accurate costing is obtained by costing the different types of education separately. If an over-all unit cost by level alone is needed, a weighted average, based upon the pupil or place distribution will suffice. An example of calculating unit cost for all second-level on the basis of an assumed pupil distribution among different types of education at this level is shown in Table 18. Higher education with its greater educational specialization was not done in detail at the Conference although the technique would be essentially the same.

Many of the problems associated with the utilization of estimated cost data are particular to the individual country and should be resolved according to the circumstances. As noted before, the divergence between unit cost estimates and outlays will depend on particular conditions such as foreign aid in kind, voluntary services, etc. Furthermore, cost data based on existing price factors and applied to the future are in terms of constant prices. The adjustments necessary for estimating expenditure in the future will also depend upon the particular price situation and projections.

Conclusion

This chapter has briefly outlined some of the analytical techniques and tools that may be called into play to aid the educational planner. What is presented here is by no means exhaustive but is meant to indicate some of the uses to which a minimum of information can be put.

Naturally the reliability of estimates and projections will depend directly upon the reliability of the basic data available in the country. No analytical devices exist which are not dependent upon adequate sources of information and an important adjunct of educational planning and all planning in general should be the improvement of basic statistical services.

Chapter IX Educational assessments

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The educational system as a basic service or as an infrastructure

Types of education in which basic service or infrastructure character is predominant

The educational system serves several purposes; of these, two seem to be outstanding. The first may be called the provision of a general cultural basis and the second the provision of more specific skills needed for the proper performance of a number of occupations. In modern economic phrasing, the first type of education provides a basic service or acts as an infrastructure to many social, economic and cultural activities. This type will be discussed in the present section.

Clearly the boundary between the two contributions made cannot be defined with precision. While some highly specialized departments of the educational system, such as a course in nuclear physics, are contributing to very specific skills used in a restricted number of occupations, a course in mathematics partly provides an element of more general education. The general secondary school will be considered part of the infrastructure, but even so it also provides the knowledge giving access to many simpler office jobs. The infrastructure character will be the more predominant the younger the pupils supposed to follow the instruction are and the larger are the numbers for which it is intended. Thus, in most countries primary education may be considered part of the infrastructure. In wealthier and developed countries the general type of secondary school will also be so considered. Whenever the primary school is not identical for all pupils but shows a more difficult curriculum for pupils who are to continue their education, parts of it may already be considered to belong to the specialized part of training. It depends, then, on the economic as well as the cultural level of the country where to put the boundary. For the purpose of this chapter we will consider the primary level in its totality and the general secondary schools as the infrastructure.

Alternative attitudes of legislators with regard to these types of education

For a long period in history education was not a matter for compulsion; but sooner or later most countries have found it appropriate to pass legislation to the effect of making some basic education compulsory. This is particularly true of primary education which is, at least on paper, obligatory now in most countries. It is well known that the actual situation differs and sometimes even deviates considerably from the legal norm. Even in highly developed countries schoolchildren in rural areas are sometimes assisting harvest operations in the midst of summer.

Gradually the school-leaving age of compulsory education has been raised. In many Western European countries it is around 15 years now. Legal interference has come from the other side too, by posing a minimum age for entering the labour force. This is a form of protection against exploitation, with a view to safeguarding health—physical as well as mental. Clearly it is desirable that the two age limits coincide, so as to make sure that no young people are without an appropriate activity. This desirable correspondence does not always exist.

Basic education should be geared to the real needs of the population. Even without any particular responsibility the citizens of present-day societies are in need of some types of knowledge and attitudes they do not always possess. Clear examples can be found in the lack of knowledge of elementary hygienic and pedagogic principles. Some of these subjects cannot be successfully taught in primary schools but require somewhat more mature pupils. There is scope for a corresponding extension—if only on a part-time basis perhaps—of compulsory education.

Some basic information about the situation with regard to compulsory education can be found in Table 20.

Estimation of need for general education under a system of compulsory schooling

In this section we take up the problem of planning for general education under a system of compulsory schooling operating completely, that is, where no discrepancy exists between legal and actual situation. The

Table 20 *Age limits of compulsory education and percentage of population in given age group attending school*

Country	Year of census (*c*) or estimate (*e*)	Age limits of compulsory education	Percentage of population in given age group attending school		
			5-6	7-9	10-14
			%	%	%
America, North					
British Honduras	1946 *c*	6-13	—	—	83
Canada	1953 *c*	Various	53	94	92
Costa Rica	1950 *c*	7-14	—	67	58
Cuba	1953 *c*	6-14	24	56	61
Dominican Rep.	1950 *c*	7-14	8	42	
El Salvador	1950 *c*	7-14	22	42	45
Guatemala	1950 *c*	7-14	—	27	25
Honduras	1956 *e*	7-15	—	49	
Mexico	1950 *c*	6-14	18	41	38
Nicaragua	1950 *c*	7-14	—	65	67
Puerto Rico	1955 *e*	8-14	88		
United States	1950 *c*	Various	39	95	96
Virgin Islands (U.S.)	1950 *c*	7-14	58	98	
America, South					
Argentina	1947 *c*	6-13	69		
Bolivia	1950 *c*	7-14	20		40
British Guiana	1946 *c*	6-14	—	—	78
Chili	1952 *c*	7-15	25	66	75
Colombia	1956 *e*	7-12	—	56	
Ecuador	1955 *e*	6-14	67		
Paraguay	1950 *c*	7-14	—	49	68
Venezuela	1950 *c*	7-13	—	49	53
Asia					
Burma	1953 *c*	6-11	56		50
Cyprus (U.K.)	1946 *c*	6-14	—	92	58
Israel	1948 *c*	5-13	37	84	85
Japan	1952 *e*	6-14	100	100	100
Pakistan	1951 *c*		8		5
Philippines	1948 *c*	7-11	8	50	75
Ryukyu Islands (U.S.)	1950 *c*	6-14	60		91
Thailand	1947 *c*	8-14	5	72	65
Turkey	1950 *c*	6-13	2	36	34

Country	Year of census (*c*) or estimate (*e*)	Age limits of compulsory education	Percentage of population in given age group attending school		
			3-6	7-9	10-15
Europe					
Austria	1954 *e*	6-14	54	98	95
Belgium	1956 *e*	6-14	98	99	93
Denmark	1955 *e*	7-14	17	97	
Finland	1955 *e*	7-15	—	96	
France	1955 *e*	6-14	99		93
Germany, Fed. Rep.	1954 *e*	6-14	33	98	100
West Berlin	1954 *e*	6-14	41	100	99
Netherlands	1953 *e*	7-14	83	99	94
Norway	1954 *e*	7-14	—	100	94
Portugal	1950 *c*	7-12	8	73	36
Spain	1954 *e*	6-12	33	78	22
Sweden	1954 *e*	7-14	—	99	90
United Kingdom					
England and Wales	1951 *c*	5-15	90	96	97
Northern Ireland	1951 *c*	5-15	82	100	90
Scotland	1951 *c*	5-15	95		99

Source: *Basic Facts and Figures*, Unesco, 1958.

problem of estimating the numbers of pupils then reduces to a purely demographic problem. It consists of estimating the numbers of children at school-going age for all ages within the legal span of years and to repeat this calculation for each year of the planning period.

The statistical basis for such estimates will be a census of population showing the numbers in each age group for the census moment. In order to estimate the changes to be expected in these figures we must know: (a) the natural movement represented by death rates and birth rates by age group; and (b) net in- or out-migration by age group.

For the moment one year after the census we find the numbers in each age class, say, of 11-year-old children, by taking the number of 10-year-olds at the census moment and deducting the number of deaths; this will be found by applying the average death rate for 10-year and for 11-year-olds to the figure of the 10-year-olds at the census date. To the result we must add the net in-migration of the same age class. The death rate just mentioned may be either the last figures known or a figure corresponding with the trend found in such death rates over a period. Usually the figures move slowly, and the two alternatives will not differ much. Similar calculations can be made for other age groups, and for later years. In principle we may so obtain the estimated future population for all age groups for all future years, except for those born after the census. The latter generations must be calculated by starting out from an estimate of the number of births in the year they are born. If by birth rate we understand the number of births per thousand women in the ages between 15 and 45, we must first estimate the number of women between those ages for the year for which we want to estimate births. Subsequently we must estimate the birth rate. As a rule we will assume that the trend found in the birth rates of previous years will continue. In the case of birth rates the changes over time may be larger than in the case of death rates and rather unexpected changes may occur. This requires periodic revisions on the basis of new evidence.

If birth rates are not expressed in terms of the number of women between 15 and 45 but of the total population we must first estimate the latter, as will be understood, and then apply the corresponding birth rate.

The same method can be used to estimate population figures for smaller geographic areas within the country, in order to estimate the needs for compulsory education by province, district or municipality. Migratory movements between such smaller areas are difficult to estimate, however, and consequently these figures are less reliable.

In countries with different religions there may also be scope for making a subdivision of the estimates according to religious groups; this applies when education is partly a matter of private activity, carried out by schools of a religious connotation.

Having estimated the need for education in terms of the numbers of pupils in the relevant age groups we may now tackle the question of translating this need into numbers of schools and numbers of teachers. As a consequence of the geographical dispersion of pupils, the size of schools must be sometimes smaller than would otherwise be the case. This depends on the maximum distance between the school and the pupils' dwellings which is acceptable. The map of the country must evidently be divided up into areas covering one school and if the pupil population in such an area is lower than the optimum size of a school, a smaller school will be needed. In areas where the density of population is high, distance to the school can be smaller and the size of the school will depend on the educational standards concerning the teacher-pupil ratio. The standard to be set here must also depend on the country's economic resources, that is, on income per head. An idea of the average ratios now prevailing will be found in Table 21.

With the aid of the teacher-pupil ratio chosen the number of teachers needed can finally be estimated. Here it may be kept in mind that in small schools one teacher may handle more than one class.

From the total numbers of teachers needed for each future year the

Table 21 *Teacher-pupil ratios in a number of countries for primary and general secondary schools*

Country	Teacher-pupil ratio			
	Year	Primary education	Year	General secondary education
Africa				
Congo (Brazzaville)	1959	0.02	1959	0.05
Congo (Leopoldville)	1959	0.02	1959	0.09
Egypt	1959	0.03	1959	0.07
Ghana	1959	0.03	1959	0.03
Kenya	1960	0.02	1960	0.06
Liberia	1959	0.03	1959	0.08
Morocco	1960	0.02	1957	0.04
Nigeria	1958	0.03	1958	0.05
Northern Rhodesia	1959	0.02	1959	0.06
Senegal	1957	0.02	1958	0.03
Sudan	1959	0.02	1959	0.05
America, North				
Canada	1959	0.04	1959	0.05
Costa Rica	1959	0.04	1959	0.05
Cuba	1956	0.03	1958	0.06
United States	1958	0.03	1958	0.06
America, South				
Argentina	1959	0.04	1959	0.14
Brazil	1960	0.03	1960	0.07
Colombia	1959	0.03	1959	0.08
Ecuador	1957	0.02	1957	0.09
Paraguay	1960	0.04	1959	0.14
Surinam	1958	0.03	1958	0.04
Venezuela	1959	0.03	1959	0.06
Asia				
Afghanistan	1959	0.02	1959	0.10
India	1958	0.03	1958	0.03
Indonesia	1959	0.03	1959	0.04
Iraq	1959	0.03	1959	0.03
Japan	1960	0.03	1960	0.04
Jordan	1959	0.03	1959	0.05
Singapore	1958	0.03	1958	0.04
Thailand	1959	0.03	1959	0.04
Turkey	1959	0.02	1959	0.05

Country	Teacher-pupil ratio			
	Year	Primary education	Year	General secondary education
Europe				
Austria	1959	0.05	1959	0.06
Denmark	1959	0.03	1959	0.07
France	1958	0.04	1958	0.03
Germany, Fed. Rep.	1959	0.03	1959	0.05
Greece	1958	0.02	1958	0.03
Netherlands	1959	0.03	1959	0.05
Norway	1959	0.05	1959	0.07
Spain	1958	0.03	1958	0.05
Sweden	1959	0.05	1959	0.07
United Kingdom	1958	0.03	1958	0.05

Source: *Basic Facts and Figures*, Unesco, 1961; *World Survey of Education*, Unesco, 1961.

flow of new teachers can be estimated. In order to do so we must know the prospective numbers of teachers who are going to retire as well as the number of deaths. Both depend to a considerable extent on the age composition of the teacher body. If no figures are available the age composition of the general population may be chosen, but this may be rather far off the mark. Especially if the teacher body is expanding rapidly the probability is high that the younger age classes will be more densely occupied than in the population at large. The flow of new teachers needed each planning year evidently equals the increase in the stock needed plus retirements and deaths.

As a last step in this chain of calculations we may estimate the increase in the number of teachers' teachers. This brings us to one of the more general aspects of education planning which will be discussed more extensively and more accurately later. For the moment we restrict ourselves to the remark that the additional teachers in primary schools in any year, say 1970, must start their own studies a considerable time before 1970 in order to be ready in 1970. This timing problem is one of the particular difficulties in an attempt to accelerate education over a wide front.

Adaptation to a new legislative situation: transition periods

We are going to discuss some of these difficulties under the assumption of a sudden rise in the legal school-going age. This results in a sudden increase in school population, requiring, in principle, a larger number of schools and teachers. As a rule, these will not be available and it will take time to make them available. For the school buildings, unless they can be obtained by changing the destination of existing buildings, the construction period, plus the time lag for all preparatory steps, will be the time period involved. This may be a couple of years. The time lag will be even longer, and this is characteristic of education problems, for the training of the necessary teachers. If there are idle teachers, the lag will not be long: but this presupposes a bad utilization of the country's human resources. If there are no idle teachers, but final-year students of general secondary schools or of primary schools are available, the time involved will be as long as the preparation for teaching lasts. In Western countries this may be four years after secondary school or ten years after primary school. There may be accelerated courses which take less time, and retraining courses converting people with a different education into teachers. Depending on the norms of the country and the availability of the various kinds of 'raw material' for teachers the time involved will vary, but it may last a number of years before a normal situation under the new legislation can be reached.

The adaptation can partly or wholly take place by an increase in the number of students taught by one teacher or the size of classes. There is a limit to what can be done in this way, depending on the educational standards and the labour conditions for teachers prevailing in the country.

Similarly, the problem of buildings can be solved by the introduction of more 'shifts' in one building or an increase in the number of schools working 'in shifts'.

All these problems will be dealt with again when they are considered for the educational system as a whole (page 197).

Possibilities and desirability of basing general education provisions on real income per head

As already stated, there appears often to be a gap between the legal and the real situation with regard to compulsory education. This should not be looked upon simply as a defect on the side of the organizers of education or of the parents of the children concerned. Other factors may be involved, especially a divergency between the legal situation and what could be called an optimal situation. When the legislation is based on prestige or idealistic considerations without regard to the country's economic and cultural situation such a divergency may result. Education requires resources in manpower and capital: the teachers as well as the pupils are withheld from directly productive work; so are the material resources such as buildings and furniture. The economic situation

Table 22 Per capita *income and percentage matriculating with respect to population of school age*

Country	*Per capita* income	Percentage matriculating with respect to population 5-14
Africa	$	%
Algeria	200-299	19
Ghana	198	47
Libya	100-199	21
Morocco	100-199	15
Egypt	130	38
North America		
Canada	1,620	84
Costa Rica	200-299	62
Guatamala	155	24
Honduras	100-199	33
Panama	200-299	61
United States	2,095	83
South America		
Brazil	100-199	33
Chile	300-399	59
Colombia	200-299	42
Peru	100-199	50
Asia		
Burma	45	25
Ceylon	116	65
China, Rep. of	Under 100	60
Cyprus	300-399	67
Iran	100-199	18
Israel	819	81
Japan	256	66
Korea	Under 100	66
Nepal	Under 100	1
Philippines	192	63
Thailand	102	56
Turkey	200-299	35
Viet-Nam	Under 100	32

Country	*Per capita* Income	Percentage matriculating with respect to population 5-14
Europe	$	%
Belgium	895	65
Finland	685	68
France	819	75
Germany, Fed. Rep.	600-699	69
Greece	298	68
Hungary	300-399	79
Ireland	586	88
Italy	432	58
Netherlands	715	67
Norway	892	77
Poland	300-399	72
Portugal	202	51
Sweden	1,431	70
Switzerland	1,287	67
England, Wales	1,248	69
Yugoslavia	100-199	71
Oceania		
Australia	1,054	78
New Zealand	1,166	87

Source: H. Correa, *The Economics of Human Resources*, Rotterdam, 1962.

of the country may be such, however, that an alternative use of these resources is preferable. This may be true for countries with very low incomes, even though it must be admitted that in such countries as a rule manpower is abundant and hence education may even be an excellent use of it.

In a general way the resources of the country should be among the factors to be taken into account when choosing the level of compulsory education. These resources can be represented by the country's real income per head.

As shown in Table 22 and Fig. 1, the extent of primary education shows some relationship with real income *per capita*. The relationship may be said to bring out the result of a large number of decisions, taken all over the world, by the individuals involved, in their attempts to adapt the state of education to the relevant factors. In a way the relationship therefore may be considered as an indication of a norm. This is not correct if there is evidence of a biased attitude with regard to primary education;

and there may have been such an attitude. As long as no other evidence of a more direct nature about the optimum solution can be produced, the relationship shown in Fig. 1 may be used to indicate how the extent of primary education can be increased *pari passu* with national income per head. Similar relationships for other types of education, especially general education, and for other types of social services generally may be used for deciding on the priorities to be given in this field, where direct calculations of the contributions made to well-being are difficult. For the more specialized types of education where the contributions are of a more direct nature, more refined methods seem possible. They are discussed later in this paper.

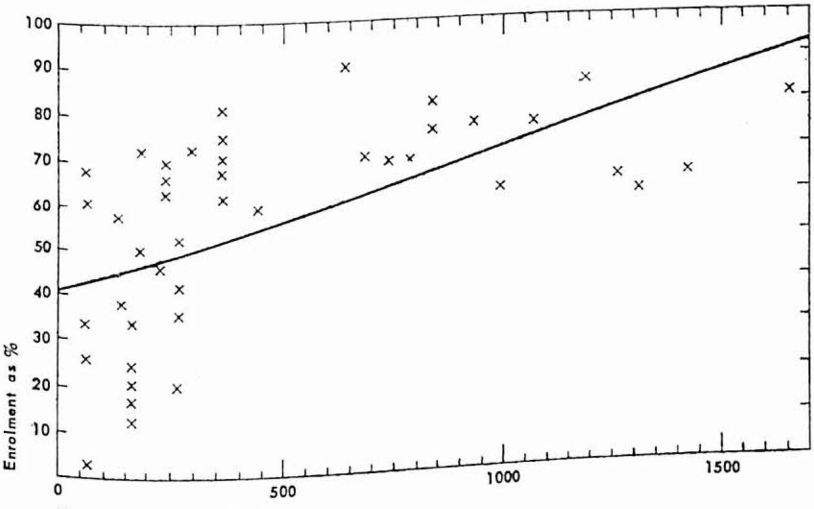

Fig. 1 Per capita *income and percentages of 5-14 population enrolled in elementary school in 48 countries.* $y = 0.0291x + 41.4685$; $r = 0.61665$. (Source: H. Correa, *The Economies of Human Resources*, Rotterdam, 1962).

The demand for qualified manpower

Relation between production and stock of qualified manpower

The second main purpose educational systems of to-day are serving is the provision of students with more specific skills needed in the production process in the widest sense, including research and even the education system. This element in education is of increasing importance, as a consequence of technological and organizational development. For an increasing number of occupations an increasing quantity of skills of rising quality are needed. The furtherance of these skills increasingly has become the objective of deliberate action in either formal or less formal education. Formal education—or education in the narrower sense—takes place in schools or similar institutions and more particularly in specialized schools—as distinct from general school education, discussed above. Informal education—or training—takes place in training on the job, in retraining courses of various types and in everyday life generally. Formal education usually will try to develop a somewhat more general type of skill, including a certain adaptability to change, in the field chosen, whereas training concentrates on the more specific skills for precisely defined occupations. As a consequence of the rapid changes in technology these more specific skills will change more rapidly also than the background education obtained in the formal part of the process. In the subsequent chapters we will discuss the planning techniques for both groups of the more specialized educational institutions. For the reasons just given there is more scope for long-term planning of the formal system; the informal system cannot so easily be planned a long time ahead. The role this difference will play in planning and in policy decisions will be described at the appropriate moment (page 197).

The basic relationship on which this planning activity must rest is the relationship between future production volumes and the stock of manpower of various types needed for it. It seems important to point out here that the process of education takes a considerable time span and that the relevant production volumes are those for a rather remote future. Production must be specified in a number of sectors of the economy making use of different types of manpower. For some types of specific education fairly wide sectors will be relevant; for other types very narrowly defined sectors with highly specialized manpower must be the basis for planning. Manpower planning, as a step towards educational planning, has to be undertaken therefore in close co-operation with general economic planning. Hence it is necessary to summarize the main elements of general economic planning. For the education planner's convenience, this will be undertaken in the following sections of this chapter. The reading list[1] indicates a number of publications giving useful technical information about a number of details. For several reasons, an execution of the economic planning process in a number of consecutive phases recommends itself.

Estimation of optimum rate of increase in national product

In the first phase a provisional decision is taken with regard to the rate of growth of national income as a whole, to be obtained during the planning period. The choice must be made by the responsible authorities on the basis of a number of alternatives to be shown by the planning agency. For each of the alternatives the annual rate of increase in national income (in constant prices) has to be specified and also the consequences for investment and saving. Generally speaking, a higher rate of increase will require a higher rate of investment of material and human resources, that is, in investment in the narrower, material, sense and in education. As a first crude approximation it may be assumed that there is a fixed ratio between the level of investment and the annual rate of increase in income—admitting a lag of the latter behind the former. This ratio is usually called the capital-output ratio; for many countries it has been found to be in the neighbourhood of 3. An example will illustrate the implications. If an annual rate of increase in income of 7 per cent is desired, the volume of investment must then be 3 × 7 = 21 per cent of national income. For alternative values of, say, 6 and 8 for the rate of increase in national income, the necessary investment level must be 18 per cent and 24 per cent, respectively. Since the capital-output ratio varies somewhat between countries and depends on the circumstances, such as unused capacity, an evaluation of its value for the country concerned is desirable. In later phases of the planning process it must be verified and in case of serious deviations between the value chosen provisionally and the later findings, the first phase may have to be revised.

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[1] See Appendix III, p. 222.

From the level of investment required the level of savings and hence of consumption can be derived if figures are available about net foreign aid to be expected. Net foreign aid is the balance between gross foreign aid (newly to be obtained) and repayment obligations on previous loans. If, for example, net foreign aid to an extent of 4 per cent of national income can be expected, the three alternative cases may be presented as in Table 23.

The fourth column indicates that in case III the level of consumption will be 3 per cent lower than in case II, expressed as a percentage of

Table 23 *Hypothetical figures about a country's macro-development in three alternative cases (per cent of national income)*

Case	Rate of growth of national income	Level of invest-ment	Level of savings	Level of consumption in year						
				0	1	2	3	4	5	6
I	6	18	14	86	91.2	96.6	102.4	108.6	115.1	122.0
II	7	21	17	83	88.8	95.0	101.7	108.8	116.4	124.6
III	8	24	20	80	86.4	93.3	100.8	108.8	117.5	126.9

national income. This only applies to the initial year, however, with given income; later, income in case III will rise more rapidly than in case II and in this case again more rapidly than in case I. The alternative patterns of consumption are represented in Fig. 2 where it is observed that consumption in case III starts out at a lower level, but in year 4 they will be equal and in year 5 consumption in case III will have overtaken consumption in case II.

The policy makers, in making up their minds for the choice, must be aware of the disadvantage case III shows in comparison with case II, for years 0 to 3 and the growing advantage for later years. In most people's minds the early years count heavily and there may be a difference of opinion between people looking farther ahead and those more concerned about the immediate future.

The choice will be partly influenced also by the expected increase in population. If this is, say, 2 per cent, a 7 per cent increase in national income is equivalent to a 5 per cent increase in income per head. All governments will want an increase in income per head which opens up better perspectives in a foreseeable future. This sets a lower limit to the rate of increase in income acceptable to a government.

So far we have assumed that the only aim of development policy is an increase in production. Usually this constitutes the most important aim, but there are other aims in addition to it. These can be taken care of in the subsequent phases; in a way they are hidden in the capital-output ratio used. This applies, for instance, when the other aims are balance of payments equilibrium and maximum employment: both will influence the choice of industries and consequently the average capital-output ratio.

Estimation of production by sectors

The first phase must have been concluded with a choice of the rate of increase in national income. For the sake of argument we will assume in our example that a 7 per cent rise has been chosen. This implies that, provisionally at least, we know the future course of income and of income per head. The second, or sector, phase of economic planning now consists of estimating the corresponding development of production in a number of sectors such as agriculture (perhaps subdivided into several sectors), transportation, trade, other services and a number of manufacturing industries. First, these sectors have to be chosen; they should bring out some of the main features of the economy and its future development. The technique most frequently used for the sector phase is input-output analysis; other techniques, such as linear programming, may also be used, however. Our illustration refers to the former method.

Here it is customary first to estimate the development over time of 'final demand' or the 'final bill of goods'. This consists of three

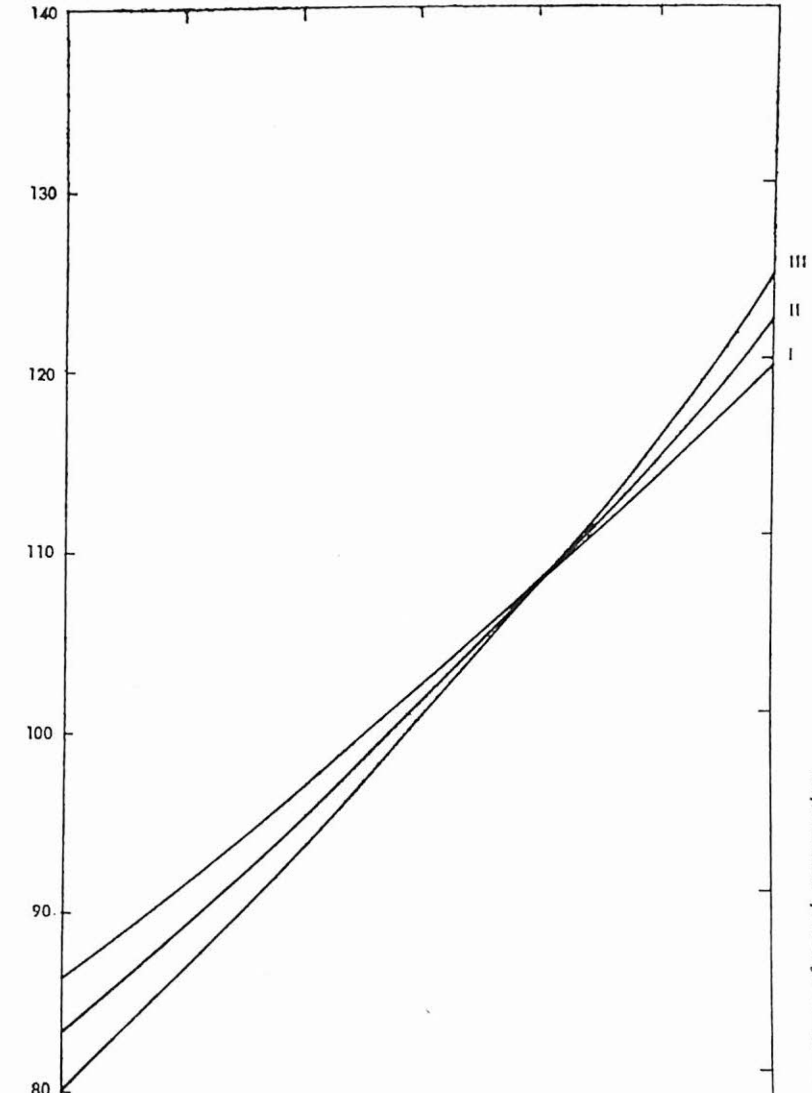

Fig. 2 *Alternative patterns of growth consumption*

components, namely consumption, export surplus and investment. These three components must now be estimated for each of the plan years.

Consumption will depend mainly on population and income per head. Population will influence it proportionately to its size; income per head exerts a more complicated influence, often represented by so-called Engel curves. These curves indicate the expenditure on various items of consumer goods as a function of income per head. Thus, total consumption for all goods in each sector can be estimated.

Export surpluses are a more difficult subject; they are equal to exports minus imports. Exports of already existing export products, in which the country's role on the world market has been stabilized, may be assumed to move proportionately to total demand on the world market or of a portion of it. This demand can be estimated on the basis of expected movements in national incomes of the customer countries. Exports of products not previously produced and of standard quality may be assumed to be equal to exportable surplus.

Imports consist of traditional imports, minus import replacements. Traditional imports can be derived from the development of home demand for them, assuming proportionality. Import replacements should be concentrated on products in which the country shows a comparative advantage. This requires incidental research of a pre-project type, later to be checked in the third phase of economic planning. Import replacement should be planned to the extent needed to keep the balance of payments in equilibrium or to meet other aims such as employment or distributional aims.

Investment as a lump sum is known from the first (macro) phase. It may be divided over the main sectors producing investment goods, such as building and metal industries. A more refined method, enabling us to check the first estimates, consists of estimating investment needs by sector, with the aid of sector capital-output ratios and a distribution over supplying sectors of the capital goods needed by each using sector. In both these estimates construction periods should be used in order to estimate the timing of the investments needed. If the country considered starts out without idle capacity, and wants to accelerate its development, a concentration of investment in the first part of the plan period may be necessary, asking for a revision of the rates of growth in the consecutive years. This complication will be less serious if the country starts out with some idle capacity or when no outspoken acceleration of development is aimed at.

For each sector we now know consumption, export surplus and investment as final uses. Adding up these three items we obtain, for each sector, the final bill of goods. By the application of the inverse of the matrix I-A, known from input-output analysis, we can then obtain the necessary production volumes for all sectors.

From these, as already observed, a more precise estimate of investments can be made. At the same time, the weighted average of the capital-output ratio can now be computed and compared with the original value assumed. If the difference is considerable, the whole set of calculations made so far must be revised.

Checking production figures by project analysis; regional plans

For the policy decisions in the field of public investment and sometimes also for those concerning private investment, the production programme arrived at in the second (sector) phase of economic planning must be 'filled up' with concrete projects to be carried out. This part of economic planning is not of immediate relevance to education planning; but it is of some indirect significance. Figures for individual projects also are a cross-check on the results of the sector planning phase. More particularly they are a cross-check on the comparative advantages to be obtained in various branches of production and hence a guide for import replacement decisions, especially for developing countries. A thorough analysis of figures on single projects therefore must be recommended, checking the assumptions on every input (raw materials, fuel, labour) and on their prices for the circumstances of the country considered; discussions with branch experts will be of great importance. The results will also constitute a check on some coefficients of the input-output table, especially if the structure of a sector changes considerably during the plan period.

Projects may also be used for the purposes of education planning if they contain sufficiently detailed data on the nature of the manpower needed. This underlines the significance, also for educational planning, of having as reliable as possible a 'project administration' as an instrument of economic planning. Since this portion of the machinery needed often represents the weakest link in the set-up it seems worth while making the point.

The checks implied in the use of project figures may lead to another revision of the programme. The figures of the most desirable development over time of the production volumes of the sectors distinguished we thus arrive at are the basis for educational planning proper which we are now going to discuss in detail.

Before doing so we may add a remark on regional figures. For various purposes of educational planning a subdivision of production volumes for sectors over regions is useful. Various techniques can be devised to arrive at such figures, though most of them are rather crude. The point should first be made, however, that they must depend on the aims of regional policy, just as much as the general plan depends on the aims of general development policy. Two extremes can be distinguished; one is a policy where regional development is made entirely dependent on the national interest and another is a policy aiming at some type of equalization of living conditions in various regions. In the first extreme case, comparative advantages of production will be the guide for choosing projects and their distribution will be in favour of regions with these comparative advantages. The favoured regions may differ between sectors, of course. In the other extreme, preference will be given to the regions most lagging behind. Investment will be directed to the poorest region first, until it has been brought to the same level as the next poorest; the two poorest will then both get investments until they reach the level of the third poorest, and so on. Usually regional policy nowadays is not at one of these extremes, but takes an intermediate position.

Apart from the deliberate choices mentioned, some conditions must be met which restrict these choices. Some industries, such as coal mining, can only be run in some regions. Other industries, of a character complementary to the so-called pushing sectors (or 'international sectors'), must be located near the pushing projects: energy and transportation being examples.

It would lead too far to elaborate more in detail the methods which can be used to meet these conditions. Reference must be made to other sources of information (see Appendix III). In what follows it will be assumed, whenever the subject of regional development is touched upon, that an economic plan for regions is available, of the same nature as the national plan already indicated in the middle of this section.

This concludes our summary of general economic planning given in the three preceding sections. One or two remarks may be added on the institutional links between general planning and educational planning. In the economic sphere, as indeed for any piece of planning work, co-operation must be organized between the general planning process and the planning process of a particular sector. Usually this means that a division of labour must be created between the central planning agency and the planning units of the ministry concerned, and possibly planning units of the private sector if such units exist. As a rule, the most efficient form of co-operation consists of a procedure in which the central planning agency starts out with a general framework, including, say, totals of the numbers of pupils for broad groups of schools and asks for comments by the ministry. After agreement has been obtained on key figures expressing the general interdependency between all sectors, the sector planning units can be asked for more precise elaboration of the plans. Most of work described in this chapter should be the task of a sector planning unit, in this case for education. It can be left to the discretion of the policy makers, however, whether such a sector planning unit should be in the ministry—as suggested above—or in the central planning agency. In the latter case it will still have to be closely linked with the Ministry of Education.

Manpower requirements by sector of production

As already stated, educational planning usually starts with the assumption that the stock of manpower of various denominations needed in production is related to the volume of production in one or more sectors. Thus, the number of bricklayers is dependent on the volume of building; the number of weavers dependent on the volume of production of weaving industries; the number of chemical engineers dependent on the volume of production of the chemical industry. Some types of manpower will be used in many sectors; thus, mechanical engineers will be used, in different intensities, in a large number of industries and so will office clerks of different denominations, lawyers, economists or carpenters. This is not a different situation, in principle, however: their numbers will depend on some weighted average of production figures for various sectors.

The simplest assumption about the relationship indicated is the one of proportionality. If that assumption is adhered to, the proportionality factor can be derived from manpower and production figures for one single year (or other time unit). The main sources of general information about manpower are censuses of population and of occupations. Sometimes this information is supplemented by sample censuses applied to a small part (chosen at random) from the population. In a number of countries other figures about employment can be obtained from social insurance data. Finally, there are a large number of special studies on one or a few sectors, such as technical and business handbooks; or information may be obtained from special inquiries. Information by direct conversations with sector experts is almost indispensable for the manpower and education planner.

The relationship may be more complicated than simple proportionality and usually is. Some of the general tendencies will be discussed here.

The first tendency concerns the changes over time in the coefficients just discussed. The general rule is that over time the number of people needed for a certain volume of production decreases as a consequence of technological and organizational development. For the economy as a whole a decrease of about 1.5 per cent per annum was observed over most of the nineteenth and early twentieth centuries. For individual sectors sudden changes may occur as a consequence of new inventions. An old example is a reduction to a few per cent only of the manpower previously needed when the production of glass bottles was mechanized in the United States of America. For larger groups of products more regular patterns are found. They cannot always be easily separated from other influences such as the scale of production. As a rule an expansion of production will require a less than proportional increase in manpower. One of the regular patterns recorded is the relationship established by Professor P. J. Verdoorn to the effect that an increase in production by

1 per cent tends to result in an increase in employment by about 0.5 per cent.

Accordingly a difference in manpower requirements between large and small enterprises is often found, reflecting, on the one hand, less specialization in small enterprises and, on the other hand, less modern methods. The combined influence on the number of qualified staff employed is not unequivocal: less specialization pointing to a relatively higher figure and less modern methods (sometimes) to a lower figure for small enterprises.

In rare cases more precise figures are available to the planner from which he can deduce alternative methods of production, and choose the optimal method under the circumstances prevailing. Thus, alternative processes of the production and harvesting of wheat are described in exact figures about the inputs of labour in a publication by G. K. Boon.[1]

Number of sectors to be chosen

In order to do as accurate a job in education planning as possible a proper choice of sectors is necessary. In principle the sectors should be as homogeneous as possible from the manpower point of view, that is, the subsectors should not differ too much among themselves with regard to the number of men needed per unit of production. But there are other principles to be met also. Some of these may refer to the objectives of economic, as distinct from educational, planning. Others are of a general character; thus, a too large number of sectors will unduly increase the costs of planning without a proportional increase in results. It should be admitted however that not much precise information about such questions is available, for the time being, in Western countries.

In addition to all this the requirements for educational planning also depend on the aims of the latter; for short-term planning considerably more detail is needed than for long-term planning. For the latter a subdivision of manpower into broad educational categories is sufficient, since we can hardly foresee how the specialized types of education will change as a consequence of technological development. For short-term educational planning however there may be scope for considerable detail in the types of manpower and this again requires more detail in the definition of sectors.

In Sweden, employment is first being estimated for seven major sectors and subsequently for thirty-five sub-groups, reproduced below. In Turkey, twenty sectors have been used. In both countries just mentioned manpower forecasts were mainly used for education planning over periods up to fifteen years. In France, where manpower planning was mainly used for investment and labour market policies, twenty-six sectors were used.

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[1] G. K. Boon, *Choice of Agricultural Technology. Five Methods for Producing Grain*, Rotterdam, Netherlands Economic Institute, April 1961.

The computations needed to estimate manpower requirements by sectors may be made in the way indicated in Table I of Appendix II where a set of examples is given of the tables to be used for the construction of an education plan. These tables are meant to be examples only; they will have to be adapted to the particular features of the plan to be constructed. Thus, they may have to contain a much larger number of years. Also, for long-term planning, desirable when general education is planned, the degree of detail may be much less than for short-term planning.

Sectors used in manpower forecasts in Sweden

Building
Mining
Metal industry
Textile clothing, leather, fur and rubber industries
Wood industry
Food, drink, and tobacco industries
Paper industry
Chemical technology industry
Graphical industry
Pottery
Energy
Miscellaneous

Railways
Other land transport
Sea transport
Air transport
Postal service and telecommunication
Stowage
Travel agencies, shipbrokers

Commerce
Banks and insurance
Real estate agencies
Hotels and restaurants

Government and municipal administration
Maintenance of law and order
Defence
Social securities
Public health service
Personal hygienics
Clerical services

Education
Libraries, museums, research bureaus
Literature, art, press services
Newspapers
Organization

Number of categories of occupations to be considered

The remarks made in the preceding section also apply here. The occupational groups to be distinguished should, in principle, be homogeneous from the educational point of view. For short-term and medium-term planning this means that homogeneity must exist with regard to the last parts of the education processes which as a rule are the most specialized portions. In the last resort planning is a preparation for policy measures. Making the subdivision into occupations therefore depends on which types of measures are envisaged. They should correspond as far as possible to those measures. A more precise treatment of this subject is given below (page 197), as well as a list of possible means of policy ('List of means of educational (and other) policies'). If the government wants to take measures in order to influence the number of trainees in specific courses, the corresponding occupations should be shown separately.

For long-term planning the main categories of schools only will be relevant, as already explained. The grouping of occupations should then, in principle, be so that each group is more or less homogeneous with regard to the manpower needs with the same broad education, that is, using the same school type as its basis.

In practice, planning must be based on whatever data are available. Often the census of occupations is the main source. The subdivision to be used will then depend on the occupations distinguished in the census.

Manpower requirements in terms of education

The manpower requirements for the various occupations in the sectors considered must now be subdivided according to educational characteristics, that is, according to the various 'educations' available for each occupation. Here again the differences between formal and informal education must be kept in mind. Strictly speaking any occupation requires first of all a formal education process, for instance, primary school and a secondary technical school, and then a training process, for instance two years training on the job. This chain of educational processes in consecutive schools will be called a 'thread'. As already observed, planning for formal education should and can be done for longer periods ahead than planning for training; the latter usually changes more quickly and takes less time than the former. The planner must be aware of the task he is charged with before choosing the classification of educations as a basis for the present regrouping. The classification proposed by Mr. S. O. Döös,[1] summarized below, classifies 300 different 'educations' (as he calls them) (at the three-digit level), grouped into 70 groups (at the two-digit level) and into 10 broader educational fields. These 'educations' themselves consist of a succession of processes, starting out all of them with primary school. Many of them also contain the general secondary school, before the specialized portion starts; others specialize after primary school or go through a semi-specialized phase first.

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[1] S. O. Döös, *Long-term Employment Forecasting. Some Problems with Special Reference to Current Organization and Methods in Sweden*, International Seminar on Employment Forecasting Techniques, Paris, OECD, 1962.

A tentative educational classification (one- and two-digit groups)

1. TECHNICAL AND SCIENCES EDUCATION
   11. Technical education, university level.

   Note: In the 3-digit classification this group is subdivided as follows:
   111 Technical physics.
   112 Machine technics, aeronautical technics, marine technics.
   113 Electro-technics.
   114 Road and water works.
   115 Chemistry.
   116 Metallurgy.
   117 Architecture.
   118 Geodesy.
   119 Higher level dairy training.

   12. Technical education, secondary level.
   13. Technical education, lower levels.
   14. University education: mathematics, physics, chemistry.
   15. University education: biological sciences.
   16. University education: medical sciences.
   17. University education: agriculture and silviculture.
   19. Technical and sciences education, n.e.c.

2. ARTS AND THEOLOGY EDUCATION
   21. University education: psychology, philosophy.
   22. University education: modern languages.
   23. University education: Scandinavian languages, literature.
   24. University education: classical languages.
   25. University education: history and related subjects.
   26. University education: theology.
   27. Other training for religious work.

3. SOCIAL SCIENCE AND COMMERCIAL EDUCATION AND TRAINING
   31. University education: social science.
   32. University education: law.
   33. University education: commercial.
   34. Training for social work.
   35. Commercial secondary education.
   36. Secretarial schools.
   36. Lower level training for commercial and clerical work.
   39. Social science and commercial education and training, n.e.c.

4. TEACHER TRAINING (non-academic)
   41. Primary school teacher training.
   42. Lower primary school, and nursery school teacher training.
   43. Training of physical instructors, music and art teachers.
   44. Training of vocational instructors, and manual arts teachers.
   45. Training of teachers in domestic work.
   49. Non-academic teacher training, n.e.c.

5. TRAINING (NON-ACADEMIC) FOR MEDICAL SCIENCE, DOMESTIC WORK AND RELATED FIELDS
    51. Training of physiotherapists and work therapists.
    52. Training of nurses and midwives.
    53. Training of dental technicians and dentists' assistants.
    54. Training for child care and care of the aged.
    55. Training of laboratory assistants.
    56. Training of health inspectors and related.
    57. Training for hotel and catering trades.
    59. Other domestic training.

6. ARTISTIC TRAINING
    61. Training at the academy of arts.
    62. Other arts schools.
    63. Training at the academy and conservatory of music.
    64. Other music schools.
    65. Journalist training.
    66. Training for commercial arts and advertising.
    69. Artistic training, n.e.c.

7. AGRICULTURAL AND SILVICULTURAL TRAINING (NON ACADEMIC-LEVEL)
    71. Training for agriculture supervisors.
    72. Agricultural schools.
    73. Horticultural training.
    74. Silvicultural training.
    75. Training in fishing and wild life care.

8. TRAINING FOR TRANSPORT, PROTECTIVE AND DEFENCE SERVICE WORK
    81. Training of merchant marine officers and seamen.
    82. Training of radio operators.
    83. Traffic hostess training.
    84. Training within government transport and communication services.
    85. Training for fire brigade, police and customs officers.
    86. Military training.

9. TRAINING FOR CRAFTS AND PRODUCTION PROCESS WORK
    91. Training for metal trades.

    Note: Subdivided as follows:
    911 Training for metal work.
    912 Training for foundry work.
    913 Training for manufacturing work.
    914 Training for automechanical work.
    915 Training for machine mechanical work.
    916 Training of thin plate worker.
    917 Training of plate worker, blacksmith, welder.
    918 Training for precision-instrument work.
    919 Training for metal work n.e.c.

    92. Training for electrical trades.
    93. Training for woodwork.
    94. Training for building and construction work.

- 95. Training for chemico-technical industry work.
- 96. Training for printing, bookbinding and related trades.
- 97. Training for textile, clothing and related trades.
- 98. Training for work within the food industry.
- 99. Training for crafts and production process work n.e.c.

0. GENERAL EDUCATION WITHOUT VOCATIONAL EDUCATION OR TRAINING
    - 01. Compulsory school level.
    - 02. Intermediate school level.
    - 03. Secondary school.

Sources: (a) Sten-Olof Döös, *Long-term Employment Forecasting. Some Problems with Special Reference to Current Organization and Methods in Sweden*, OECD, 1962; (b) National Labour Market Board, Sweden.

As a rule, one occupation can be taken by people with different educational backgrounds. Thus, commercial directors in a large firm may or may not have a university education, and if they have one, they may be lawyers or economists or even engineers. A chemical technician may be a chemical engineer or a doctor of chemistry from the faculty of sciences. A skilled worker may have gone through an industrial school or through an accelerated retraining course, and so on. The relationships between manpower and education required are rather vague relations, therefore, with a wide margin of error.

For an orderly execution of our planning calculations it will be assumed that the most desirable distribution of the manpower in a given occupation over the various threads of education is known. For the present it will be assumed to coincide with the actual situation and for the future it will be assumed that we can indicate the most desirable changes in that pattern.

The corrections and adaptations which it will be found necessary to carry out later will be discussed below (page 197).

As an example, Table II of Appendix II shows the figures which must be estimated. In columns 11, 12, 13 and 14 it is assumed that a gradual change over time in the relative composition of occupation 834 in industry sector No. 2 takes place. As indicated in that table we can then estimate the numbers needed over the years in each occupational-educational group.

In conclusion, it may be observed that some of the steps in the planning process just discussed may sometimes be skipped. The aim is to have manpower estimates in terms of 'threads'. In order to obtain these it is not always necessary to estimate sector and occupation figures first. In principle this depends on the factors supposed to determine the education figures. For long-term planning these factors may be of a more general character, such as general technological and educational trends; it is then not necessary to take the intermediate steps.

Education as a supplier of qualified manpower

Changes in the stock of manpower by death, retirement and recruitment

As a result of the calculations made along the lines indicated above we are left with the figures for the 'stocks' of manpower of various qualifications needed for the execution of the production process in a series of years extending into the future. The qualifications in detail can be reliably estimated for only the not too distant future because of the rapid change in technology. The broader basic qualifications can be estimated over a longer period. We assume that manpower has finally been arranged in terms of the 'thread of education' needed.

The problem now to be considered is the derivation, from these figures on stocks, of the numbers of newly trained people or new entrants into the labour force each year of the plan period. The solution of this problem rests on the simple fact that changes in the stock occur as a consequence of (a) death, (b) retirement and (c) recruitment of the newly trained. It follows that the number of newly trained to be recruited equals the increase in stock desired, plus replacement for death and retirement. We must estimate, therefore, mortality and retirement for the various groups considered.

Mortality differs between age groups and, within each age group, on the special risks of the occupation. Average mortality rates for each age group of the population are known from demographic statistics. In many countries a good deal of information is also known about death rates for particular professions and occupations.

Because of the influence of age on mortality the age distribution of the stock of manpower in a particular group is of importance too for the present problem. This may differ considerably between different occupations, depending on the history of the industry. Old, stagnant industries will show relatively large numbers of old people, whereas young, rapidly growing industries will show relatively large numbers of young participants.

Retirement will depend primarily on legal schemes for old-age pensions and in addition on the phenomenon of invalidity, as for instance in mining. Statistically an equivalent to retirement is a possible shift from one group to another. Whether this is possible depends to a high degree on the nature of the groups considered. Mobility of this type is only possible between groups which are in a way equivalent. When, for long-term planning purposes, we are considering broad groups, mobility will be far less than when we are considering, for short-term purposes, narrowly defined groups. For the time being we do not distinguish between the two types of retirement. In the next section we shall come back to shifts between occupations as a possible adjustment.

The estimation of the figures so far discussed in this section may be undertaken as indicated in Tables III and IV of Appendix II. Often the precise calculations can only be made—if at all—for a census year. This is assumed to be done in Table III, which is self-explanatory. Whenever the data on age distribution and mortality are not known for the exact group under consideration we must take a group which is comparable. Age distribution will often be found in the census, while mortality rates for occupational groups may be obtained from social or private insurance agencies. The age distribution may be subdivided in a way different from the one chosen by us; it should be a sub-distribution into more or less homogeneous mortality groups. The retirement rate will depend on the legal schemes for retirement; if, for instance, people retire at the age of 65, the number of 64-year-olds in the manpower stock will be a good estimate. In professions with high rates of occupational illnesses these figures must be considered also. Our assumption is that shifts to other occupations are recorded as retirement by the statistics pertaining to the occupation. Therefore there is no problem if such statistics are available. If there are no such statistics, an estimate of the shift must be made. In order to explain the necessary further calculations as clearly as possible, we will now assume, until the section on 'Summary picture of needs for education', that we discuss the estimation of the new entrants in a given occupational-educational group needed in one given future year. Later this must be repeated for all the years in the plan period. With the results of Table III, Table IV can be calculated.

A final remark in this section must be made in respect to an arithmetical detail already built into Table IV. In order to obtain figures on new entrants needed for calender years we must start out with stock figures pertaining to the end (or beginning) of years rather than to calendar years as an average. As indicated in the 'sources' explanation of Table IV, under columns 11-14, these beginning-of-year figures are simply estimated by taking the average of the two successive years involved. This step, or something more precise which may sometimes be possible, should not be overlooked.

Requirements in terms of pupils starting their education

Since each of the 'threads' considered needs time and consists of a chain of schools to be gone through successively, we can derive the number of students starting their education from the desired numbers of trained people. The former differ in two ways from the latter: they are more numerous and they have to be available at an earlier date. They have to be more numerous since each school or course shows 'losses' of students who do not reach the final stage. As an example let us consider the education of economists with university training. Their normal training may be taken to consist of six years of primary school, six years' secondary school and six years' university. If the loss percentages are 10, 20 and 40 per cent respectively, in terms of the initial numbers, and if 432 economists must be available in 1980, then in 1974, 720 students must start their economics studies; in 1968, 900 pupils must start secondary school; and in 1962, 1,000 pupils must start primary school. As another example let us take metal turners. Let their training be 6 years' primary school, 4 years' technical school and 2 years' training on the job; let the loss percentages be 10 per cent for all three stages. If, then, in 1974, 729 metal turners are needed, in 1972, 810 must apply for the training course, in 1968, 900 must start the technical school and in 1962, 1,000 must start primary school.

The losses just discussed are net losses, resulting from: (a) gross losses, due to the number of students in any grade who leave the school or must repeat their grade; and (b) gains from the numbers who must repeat the next grade. In this way we need not take into account the phenomenon that some students take longer to finish the school; we use the abstraction that all are staying the normal time and adjust the loss figures so as to account for this phenomenon.

It seems appropriate to bring into a systematic form the relationships just discussed. This can be done for each 'thread' we distinguish as shown in Table V of Appendix II. This table is self-explanatory and columns 1-11 supply us with a complete time-table of the number of students or trainees in each 'grade' or 'year' between the calendar years 1959 and 1967. Columns 12 and 13 are used at a later stage and will be explained below (see 'Surpluses or deficiencies of manpower by category').

The pupils 'lost' during any process of education are lost only for the goal originally aimed at. They are not lost for society. Usually they will be available for simpler occupations than originally envisaged (in principle, for any occupation requiring the education they have already finished, which is an education coinciding with part of the one initially considered). Thus a boy who fails to complete university will be available for a function requiring secondary school only or for another education requiring secondary school.

Required availability of potential pupils at various levels

Starting out with the specialized educations and 'projecting back' as shown above we will find that we arrive at the more general or basic types of education where many flows combine. With the aid of a complete set of educations for all final 'destinations' we can find the numbers of pupils needed in the more general types of schools. Thus, the secondary schools have to supply pupils for all later stages possible for each type: secondary schools giving access, say, to university studies in the sciences and technology must supply pupils to all the departments of sciences and technology. In principle what we need is a 'flow diagram' of educations, of which an example is reproduced in Fig. 3. If each final destination in education could only be reached in one way, the structure of this table would be relatively simple (as in our example): going from the bottom to the top we would only have the splitting-off of branches, leading to an ever-increasing number of them. In reality it is more complicated, because, as we have seen, one occupation may often be reached along alternative roads. This means that some of the flows will ultimately meet.

In the flow diagram just discussed we again encounter the phenomenon of some educations which cover part of other educations, discussed at the end of the preceding section. Such 'part educations' are not only supplied directly, but are also acquired by those who have failed to finish one of the longer educations containing the part education. We have already mentioned the example of the boy who does not finish his university education and then becomes available for an occupation requiring secondary school. The total numbers available for the latter occupation thus consist of those educated in the direct or regular way, plus the 'losses' from longer educations. We will illustrate this in Table VII of Appendix II, to be discussed below under 'Long-term planning of education'.

Need for teachers and equipment at various levels

From the numbers of pupils at all levels necessary to supply the future new manpower estimated, the number of teachers of all denominations and the equipment needed can also be calculated. Again we may start out from normal teacher-student ratios for the various types of schools and then apply variations with a minimum and a maximum value. Some statistical ratios for a number of types of schools in a few countries are given in Table 24. For concrete planning work the ratios to be applied should be discussed with experts of the school types under discussion.

In principle, there is a problem here: since the new teachers needed have themselves to be taught, there is a 'second-order' need for teachers, and possibly higher-order needs. This chain of additional teachers needed will soon end if the time required for their teaching is relatively long, because each new 'order of teacher need' must be trained before the previous one is needed. Thus, if in 1983 10,000 new teachers are needed, their own training will require, say, 400 additional, 'second order' teachers, but these have to be available in 1973 when their training requires 10 years; for these, 16 'third order' teachers will be needed, but these must already be available in 1963 and there is no point in talking about the one additional 'fourth order' teacher who should have been available in 1953 since this is already past. In addition, the numbers converge rapidly.

Table 24 *Teacher-student ratios in a number of countries for three types of education*

Country	Teacher-student ratio					
	Year	Second level (vocational education)	Year	Second level (teacher training)	Year	Third level
Africa						
Congo (Brazzaville)	1959	0.06		—		—
Congo (Leopoldville)	1959	0.13	1959	0.05		—
Egypt	1959	0.07	1959	0.12	1959	0.04
Ghana	1959	0.05	1959	0.09	1959	0.16
Kenya	1960	0.09	1960	0.09		—
Liberia	1959	0.10	1959	0.08	1956	0.15
Nigeria	1958	0.04	1958	0.07		—
Northern Rhodesia	1959	0.09	1959	0.09	1959	0.07
Senegal	1958	0.03		—	1958	0.04
Sudan	1959	0.08	1959	0.11	1959	0.10
America, North						
Canada	1958	0.05	1959	0.06	1958	0.13
Costa Rica	1959	0.04	1959	0.05	1959	0.08
Cuba	1958	0.11	1958	0.07	1956	0.08
United States		—		—	1958	0.12
America, South						
Argentina	1959	0.13	1959	0.12	1959	0.05
Brazil	1960	0.10	1960	0.15	1959	0.21
Colombia	1959	0.05	1959	0.10	1959	0.20
Ecuador	1957	0.08	1957	0.07	1958	0.13
Paraguay	1959	0.05	1959	0.11	1957	0.10
Surinam	1957	0.03	1958	0.12	1958	0.27
Venezuela	1959	0.06	1959	0.06	1958	0.11
Asia						
Afghanistan	1959	0.08	1954	0.05	1955	0.07
India	1958	0.06	1958	0.09	1957	0.06
Indonesia	1959	0.16	1959	0.11	1957	0.11
Iraq	1959	0.07	1958	0.03	1959	0.05
Japan		—	1958	0.08	1960	0.07
Jordan	1959	0.09	1959	0.10	1957	0.11
Singapore	1958	0.05		—		—
Thailand	1959	0.05	1959	0.08	1960	0.07
Turkey	1959	0.09	1959	0.04	1957	0.07

Country	Teacher-student ratio					
	Year	Second level (vocational education	Year	Second level (teacher training)	Year	Third level
Europe						
Austria	1959	0.07	1959	0.13	1959	0.11
Denmark		—		—	1958	0.12
France	1958	0.04	1958	0.07		—
Germany, Fed. Rep.	1959	0.03		—		—
Greece	1956	0.07		—	1958	0.04
Netherlands	1959	0.09	1957	0.16	1957	0.04
Norway	1958	0.14	1959	0.14	1958	0.16
Spain	1958	0.05	1958	0.07	1958	0.07
Sweden		—		—	1959	0.05

Sources: (a) *Basic Facts and Figures*, Unesco; (b) *World Survey of Education*, Unesco.

For the exact estimation of the numbers of teachers and schools needed in the future, the remarks made above under 'Estimation of need for general education under a system of compulsory schooling' apply. They imply that normal student-teacher ratios cannot be applied to areas with a low density of students.

The remark may be added here that there is a clear similarity between manpower and capital equipment, since both are 'durable' goods. Education of new manpower accordingly compares with new investment. Teachers, a 'durable good' again, 'producing' the newly educated can be compared with second-order capital goods, as distinguished in some models of economic growth.[1]

Summary picture of needs for education

By adding up the requirements for teachers—first and higher order—we obtain a complete picture of the numbers of pupils of all school types and training courses considered for all years between today and the year in which the 'finished manpower' is needed. We must remember that this exercise can and must be undertaken not for one future year but for all future years. Some types of schools will not only have to train students to be ready five years from now but will also have to train others

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[1] cf. J. Tinbergen and H. C. Bos, *Mathematical Models of Economic Growth* New York, 1962, p. 56.

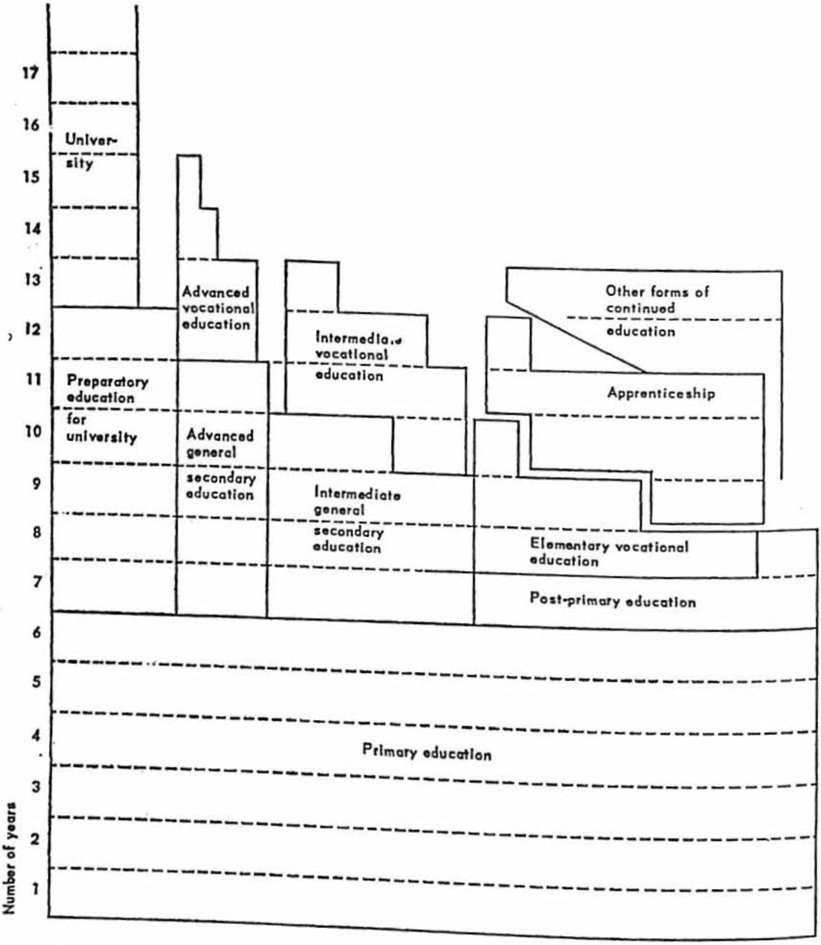
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Number of years
University
Preparatory education for university
Advanced vocational education
Advanced general secondary education
Intermediate vocational education
Intermediate general secondary education
Other forms of continued education
Apprenticeship
Elementary vocational education
Post-primary education
Primary education

Fig. 3 *The Dutch educational system*

for another occupation, to be ready three years from now. The total programme for such a school is therefore equal to the sum total of all these requirements.

In any given plan year, educational activities will therefore partly be directed at satisfying needs for 'finished manpower' one year hence and partly at satisfying such needs for years farther ahead, anything between two and twenty-five years ahead. The character of these activities differs. Education for occupations to be taken one or two years ahead must be very precise and decisions on details must be taken. Nowadays a considerable number of accelerated training or retraining courses are given, directed at creating precisely defined skills. There must be considerable differentiation in such courses. Activities directed at creating finished manpower fifteen or twenty years from now usually will only be primary or at most secondary school activities. Here no great precision or differentiation is called for; these trainees are still in the preparatory phase of their formation. But the numbers of trainees should be based on what we estimate will be the future and not the present requirements for the occupations needed fifteen or twenty years ahead. By making the distinction between the years in which the finished manpower must be available we can automatically bring into the picture this different treatment. In the summary tables we should therefore arrange the estimated numbers of pupils according to the time necessary for reaching the goal.

Comparison of plans with actual developments; measures, revisions

Surpluses or deficiencies of manpower by category

In the preceding sections we defined a number of occupations and estimated the number of people who should be available, in each of a number of future years, in order to achieve the most desirable development of production. From these figures we derived the numbers of new entrants into these occupations necessary to supplement the already existing stock, after correction for retirement and death. For each occupation we then defined a number of alternative threads of education, including—if so desired—informal training processes, and 'projected back' the numbers of students or trainees of the corresponding chain of educational processes needed at various levels, especially at the start of each process. For each of the alternative processes the numbers of participants were chosen in accordance with recent observations, unless clear indications were available for a different choice. Finally, estimates of the need for teachers, themselves requiring training, were made. All this has resulted in estimates, covering a number of years, of the numbers of students or trainees who must attend the various schools or courses in order to produce, at the appropriate moment, the right number of new entrants to the occupations chosen. There is, of course, no point in projecting back beyond the year of planning. Thus, if we are in 1963 and preparing a plan for 1964, no figures need be carried back until 1962; they can stop at 1963. The ideal table we have drawn up shows, for all years, beginning with 1963 and extending into the future, the numbers of students or trainees required for each type of school or course distinguished in our plan, together with the 'grade' or 'year' in which they should be enrolled. The 1963 figures can now be compared with reality and for each type of student or trainee the surplus or deficit may be calculated. An example of such a table will be found in Appendix II (see Table V).

Such tables will also show on the last line the numbers of trainees who are expected to finish their training in 1963 and hence become available to join the labour force.

It may be appropriate here to refer back to a preparatory piece of work which the education planner will need in order to do a useful job, i.e. a picture of the initial situation from which any policy has to start. In a way, such a description of the actual state of affairs must always be the starting point and the reader's attention has already been drawn to this.

By now it will be clear to the statistician which information is of particular use to the planning process. As far as possible, the data to be collected should concentrate on the phenomena and concepts introduced above. These things are essential, while other elements may be superfluous. As is well known, statistics which make sense must be based on an analysis of the problems to be solved with their help; we have attempted such an analysis in the preceding sections.

A description of the initial situation may reveal an already existing shortage—according to certain standards—of some types of qualified persons, such as doctors. The statement of such a shortage is also implied however, in our method: it presupposes that we link up the necessary number of doctors in future years with the population just as we linked up other manpower figures with the volume of production of a given type.

A macro-economic check

Before discussing the conclusions to be drawn in detail from Table V (Appendix II) we must carry out a check on the macro-economic assumptions on which our manpower estimates are based. These macro-economic assumptions have been described above (p. 176). As a rule they do not deal with the educational potential of the country; rather, they silently imply that the educational effort needed can be accomplished. Since the financial side of this effort is of a smaller order of magnitude than the one needed for material investments, the educational side is not a bottle-neck. There may, however, be a bottle-neck in the number of qualified people available initially for the twofold task of production and education. This number is composed of the national manpower available, plus possible technical assistance, in terms of foreign manpower, which may be received; even so it may not be sufficient to carry out the development plan in its initial stages.

The importance of the check to be discussed lies in the possibility that the bottle-neck in qualified manpower will not be discovered immediately. If there is a shortage of qualified manpower, production may attract sufficient numbers of the categories needed to the detriment of the teaching staff of both secondary and third-level education: productive enterprises can often pay higher salaries than educational institutions. This drainage of the school system will not immediately affect production, but may well constitute a danger for the future. Our macro-economic check consists of comparing the total of qualified manpower available at the beginning with the joint requirements of production and education. If total manpower is insufficient, the production targets together with the education targets must be lowered. The macro-economic pattern of development must be chosen in such a way that its initial manpower requirements do not exceed the numbers available. It is true that a strain may be imposed on both sides by reducing the allocation of qualified manpower to a lower figure than that normally required: classes may be enlarged and the utmost economy of qualified manpower asked from industry; but there are limits to these possibilities which should be kept in mind.

The problem involved is somewhat more complicated than all the other problems dealt with in this chapter, since an intertemporal equilibrium is involved which in principle can only be handled with the aid of more sophisticated methods. An example of such methods will be found in Appendix I. As a crude approximation, the following method may be suggested. By varying both the initial level of total production and the rate of growth for the first ten years an optimum combination of both may be found which in the initial years does not require as an average more qualified manpower than can be made available from internal and external sources.

List of means of educational (and other) policies

In order to set out systematically the use that can be made of the planning figures we must now introduce the concept of means of educational (and other) policy the government is willing to use in order to influence educational and related developments. Often the most immediately related developments are those in the labour market and among the not strictly educational means of policy labour market policies will stand out. Examples of educational means of policy are the following decisions: (a) to open new schools; (b) to limit the number of students or trainees admitted in any existing school or course; (c) to encourage participation in some courses by propaganda or by subsidies; or (d) to change the curriculum of an institution. Examples of other means of policy are: (a) increased expenditure on public works to stimulate the general demand for labour; (b) decisions to increase or decrease wages or salaries of some categories; (c) decisions to limit or to expand immigration of foreigners, and so on.

In principle, a government following a deliberate policy should be aware of all the means available and acceptable to it and it can therefore—possibly also in principle—draw up a list of these means or decisions. This list should be so arranged as to indicate also the time lags needed for the results of the measure to operate in the way hoped for.

Instantaneous adaptations

We will discuss here the various ways in which the surpluses and deficits stated above (p. 197) can be dealt with in the order of the time lags involved; this means that we will discuss first of all the short-term and medium-term and later the longer-term adaptations which will take place. These are not necessarily all measures taken by government agencies. Society—that is, producers and consumers—will also absorb some of the deviations.

The first type of deviations to be discussed are those found in the numbers available for entry into the labour force. In occupations where fewer new entrants are available than planned, production will simply have to accept this *fait accompli* by either a reduction in production or understaffing. The same applies to the education process itself: if too few teachers are becoming available, either fewer pupils will have to be taken or classes enlarged. If a given type of production requires the services of manpower in several occupations, clearly the severest bottleneck will be decisive.

For other occupations, the number of new entrants available may exceed the number needed according to the plan. Here, either production will surpass the plan or part of the corresponding labour force will be unemployed; sometimes there may be a shift to other occupations. To the extent that substitution of one type of manpower (in short supply) by another type (in abundance) is possible, this will take place automatically.

Finally it may be possible to import manpower with certain qualifications or to reduce the number of work licences granted to foreigners.

Short-term and medium-term adaptations in education

Among the measures which the authorities can take in order to bridge the gap between demand and supply in a relatively short period—up to a few years—there are first of all measures in the field of education. In principle such short-term or medium-term measures must refer to types of training requiring at most a couple of years, including preparation and administrative delays. These types of training will be either the last portions of an education—the 'finishing touch'—aiming at acquiring the practical skills of the occupations concerned or the accelerated retraining courses which become more and more numerous as a consequence of the acceleration in technological development. If, for example, such a course takes two years, including all preparatory delays, in 1963 we must decide on the basis of estimates for 1965. We will discuss the problems arising with the aid of Table VI, Appendix II, referring to an occupation for which there are three educations (mentioned in column 1) which are supplying manpower exclusively for this occupation (No. 834). We know from Appendix II, Table V, discussed on page 197, how many new entrants into the occupation considered are needed in 1965 and how many students this requires in 1963 (taking into account the 'losses' which will occur meanwhile). In our example taken from Table VI, 700 are needed in 1963. We also know which educations are able to supply such new entrants. Let there be two 'normal' educations taking four years and, in addition, an accelerated training course taking two years. We know how many trainees now enrolled in the normal course will be ready in 1965. The most desirable number of new trainees for the two-year course to start in 1963 is then found by deducting from the required total number of trainees (700) the number of students available from the normal education (who are now two years from their final examination). In our example these number 540. The accelerated course must therefore try to attract $x = 700—540 = 160$ students. This figure is calculated on the assumption that the numbers 240 and 300 cannot be stepped up. However, it may sometimes be possible to increase the supply, and this will be discussed below.

This sort of 'corrective action' can be undertaken in 1963 for all occupations of which the supply can be adapted by such short-term courses. Of course it is only necessary when no other bottle-necks already reduce the volume of production. By their nature the decisions discussed must take for granted everything that is happening in the longer-term education processes. Measures regarding these processes can only exert influence in later years. They will be discussed under the next heading.

The calculations discussed so far and illustrated by Table VI (Appendix II) were based on the assumption that educations 721, 722 and 734 train people for occupation 834 only. However, certain educations can lead to more than one occupation. The most systematic solution is to consider all the occupations involved simultaneously, that is, to determine for a specified group of occupations all educations which are found among members of the group. Educational policy in the restricted sense of the word only has to see to it that the total numbers of students of each education become available. Their distribution between the various occupations they are able to take may be a matter of counselling and of income changes so as to redirect people. The need for such measures may also be discussed, of course, with the aid of tables such as Table VI. This implies that the figures 240 and 300 in column 4 are to be considered as variables, subject to change. The full weight of the adaptation need not then fall on the figure x only.

In considering Table VI it should not be forgotten that complete threads of education usually take much longer than four years, the figure assumed in that table. As a rule they consist of a succession of education processes in different schools and the last phase considered in our example may actually represent a new school, to which admission is also possible from other backgrounds. Possibilities similar to those now assumed to influence x may then be available to influence the figures 240 and 300 in our example.

Short-term measures of other types

Adaptations between demand and supply can also be obtained with the aid of other measures. Thus, if a shortage of some types of manpower must be expected, say in the building trades, a reduction in construction expenditure may be envisaged in order to avoid inflationary pressures in the building market. Inversely, if a surplus of manpower is foreseen it is possible to increase, at relatively short notice, the demand for construction.

There are a series of other possibilities; working hours may be increased or decreased; special part-time jobs may be created to attract women and so on. These are not educational measures, but the interconnexions with the latter will be clear and the examples quoted show the necessity of co-operation between social, economic and educational authorities in order to arrive at a balanced situation with regard to manpower. This co-operation must be organized within the framework of the general economic plan which was discussed earlier (see p. 175).

Longer-term adaptations in education

Here we are concerned with measures in the educational field operating at somewhat longer notice than those we have just discussed. Table VI (Appendix II) will again serve as an example; columns 6 to 8 will be explained and used. Looking ahead over longer periods makes it possible to affect the participation in educations 721 and 722. If, for instance, a four-year planning period is assumed, the numbers of trainees starting these educations can be influenced. A comparison as shown in columns 7 and 8 can now be made. In column 7 we insert the numbers of applicants to be expected from a forecast (as distinct from a plan), based on previous figures, as shown by statistics, with allowance for trend and possible other factors at work. These figures are compared with those of column 8, obtained, in principle, from planning, that is, from a table such as Table V (column 7, line S 1). The basis of these figures is a set of normative ideas as to which types of education are most desirable for occupation 834. The upper three figures of column 8 must of course add up to the total numbers required for the occupation.

It seems useful to add a few words about the influence exerted by short-term decisions, taken on the basis of column 5, on the longer-term situation as brought out by column 7. If, for instance, the number of trainees of the accelerated course (x) is larger than was, and is, considered desirable for normative, educative or other reasons, this may influence the composition of the manpower stock from 1965 on. As a consequence, the most desirable composition of the group of new entrants into the occupation in 1966 and 1967 may now become different from what it might otherwise have been. This implies that decisions on the value of x can, in principle, change the figures of column 8 themselves, taken from previous tables, down to Table II. We will not enter into the mathematics of this interdependence but only state the possibility. Our remark illustrates the possible need for a second approximation, once the results of the set of tables in Appendix II have been obtained. The efficiency of such planning in successive approximations has been discussed elsewhere.[1]

Long-term planning of education

Because of the long time lags involved in complete education processes there is considerable scope for planning as long as fifteen or even twenty-five years ahead in education. Such planning cannot, however, deal with a number of details of training, since it must be assumed that the rapid development of technology will affect them in an almost unforeseeable way. There remains, however, the genuine desirability of planning the main features of the education system. This means mainly that the numbers of pupils in schools of general education should as far as possible be geared to the prospective future needs for the general skills provided by these schools. While essentially the same methods can be used as those already explained for short-term and medium-term planning of manpower, the need for detailed subdivisions no longer exists. Instead of this we need the agglomeration of a number of educations, requiring the same basic education process. Since the numbers of pupils in the primary schools will depend more on the demographic and legal considerations set out above (p. 165 et seq.), the most important types of general education to be planned are those beyond the compulsory stage or the main subdivisions of compulsory schooling. This will apply to general secondary schools, of which there are a number of alternative types, and university training according to such broad categories as entire faculties.

An example of the approaches which seem useful will be found in

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[1] J. Tinbergen, 'Planning in Stages', *Statsøkonomisk Tidsskrift*, 1962, p. 1.

Table VII (Appendix II), assumed to refer to one of the secondary school types. In column 1 all the educations (to be expected for the future) making use of school type B must be listed. These will be educations of varying length as illustrated by column 2. Accordingly the link with new entrants into the occupations supposed to be served by each of the educations must be estimated for future years differing between themselves. The numbers required to start school B must be larger (columns 5 and 6) because of the losses to be expected meanwhile. These are supposed to be known from general information about the education system as shown in Table V, column 2. They have to be applied over the full length of the entire education after entrance to school B; but a correction must be made for the availability of previous losses beyond the level of school B. More precisely, those who have failed a later stage (recorded in column 6) will be available for the part education 240 consisting of school B only and for the other educations listed and the total numbers needed must be diminished by the amount of these losses. This is done by subtracting 500. This figure is less than the losses recorded in column 6, because it represents similar losses made in previous years. As a result the numbers required to start school B in 1964 are found in column 7 to be 13,220.

Similar estimations can be made for the other general school types. As we have already observed (see 'Manpower requirements in terms of education' above), long-term estimates of the need for some types of education may be made without the intermediary estimates of the numbers needed in the corresponding sectors and occupations. The factors behind the shift from one education to another are often of a more general character and common to a larger number of occupations or even sectors. There may be direct information on such factors of a technological or educational character. Their influence on total requirements may be derived from the trends in educational statistics directly instead of from the sources discussed so far. The planner must adapt himself to the data available.

Revision of plans

Plans of any nature must be revised from time to time: new data become available due to the passage of time and also as a result of new research. This is self-evident; the point to be made is not to revise the plan figures too often, but to set fixed dates for such revisions. Between any two such dates the new information may be filed and all the accumulated information can then be used at the same time. This is a more efficient approach than a revision each time that new data become available. An exception to this rule may be justified either when very important new information becomes available or when an important policy decision must be taken. Otherwise a revision once or twice a year seems ample. Annual revisions are logical if there is an annual adaptation of policies when the budget is submitted. Semi-annual revisions sometimes make sense as a check in the middle of the year; it is doubtful whether this is necessary for all educational policies; presumably only for the short-term measures involved.

Concluding remarks

An attempt has been made here to describe in detail the consecutive steps which together constitute a logical and sharply defined system of education planning. Some of the terms chosen and several of the examples used for illustration may suggest much more precision than can be attained in practice. This has been done deliberately in order to create, in the reader's mind, a precise picture of the relationships used. As always in any practical activity, the system must be adapted to possibilities and to what is desirable. Much common sense must be used for such an adaptation, but general rules cannot easily be formulated.

Thus one must be aware of what is available in the statistical field and of what each country can afford. If information is lacking, data from similar countries may be useful. There should be harmony between the aims in the economic, the social and the educational fields. Plans should be flexible and periodical revisions—as already pointed out—are necessary. The usual limitations as to what it is possible to plan and regulate have to be kept in mind. The approach chosen must reflect a certain strategy and general standards in accordance with the surroundings. Practical people will be aware of all these and similar caveats.

Appendixes

Macro-economic educational planning: a method[1]

In this appendix, an example is offered of a method of macro-economic educational planning. The essence of it is formed by an algebraic solution of the system of equations which describe the interrelation characteristic for the macro-economic problem of education planning. These interdependencies do not permit a clear treatment without some formulae. As a first approximation, however, the method followed in the text can be used (see 'A macro-economic check', p. 198). This appendix is meant to be background material for education planners.

The model shown here is the simplest conceivable version to bring out some of the main features of the relationship between economic development and education requirements. Since it was published various more refined versions of it have been developed[2] which have also been used in case studies for Greece, Spain and Turkey, to be published by OECD. The generalizations consist of (a) giving a non-linear, statistically tested form to the relation between manpower and economic variables (production and productivity); (b) introducing more sectors of production; (c) introducing more types of education; (d) introducing more explicitly the phenomenon of fall-out during the education

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1. By H. Correa and J. Tinbergen; first published in 'Quantitative adaption of education to accelerated growth', *Kyklos*, Vol. XV, 1962, p. 776.
2. One of the further applications can be found in the article by J. Tinbergen, 'Introductory remarks on the Ization Problem', *Zeitschrift für die gesamte Staatswissenschaft*, 119, 1963, p. 328.

process; (e) introducing the phenomena of incomplete participation of qualified manpower in the production process.

Quantitative adaptation of education to accelerated growth

The problems to be treated

It is increasingly felt that human skills are among the important inputs in production and that economic development must be accompanied by an expansion of education. Development must even be preceded by an increase in educational activity because of the long time lags involved: it takes six years to complete each of the basic processes of education: the primary, the secondary, and the third-level process of training. These lags can be avoided to some extent only when, as a temporary measure, imported manpower is used. The present article deals with the quantitative side of some of the problems involved. It does so with the aid of an extremely simple model—of the input-output type—in which all ordinary economic activity is fully aggregated and represented by the production volume v and educational activity represented by two sectors, those of secondary and third-level education. The numbers of students in these two sectors are indicated by n^2 and n^3, respectively; further variables are:

N^2, the total stock of people with a secondary education;
N^3, those with a third-level education;
m^2 those among the N^2 who have entered less than six years ago; and
m^3 those among the N^3 who have entered less than six years ago.

It is believed that the essential quantitative aspects of the problems can be studied with the aid of the model presented below. Three main problems will be considered:

1. What structure of the educational system is needed in order to let the economy grow at a given rate, and how does it change with that growth rate?
2. What foreign assistance is needed if the growth of the economy has to be accelerated without changing the technical coefficients of either the economy or the education system?
3. What adaptations are needed if the same acceleration is to be obtained without foreign assistance?

The precise formulation of the problems considered can only be given after the model has been described.

The model used

The variables of the model have already been defined. The relationships assumed to exist between these variables are the following:

$$N_t^2 = \nu^2 v_t \tag{1}$$

This equation requires that the number of people with secondary education is proportional to the volume of production in the same time period. The coefficient ν^2 is considered a technical coefficient.

$$N^2_t = (1 - \lambda^2)\ N^2_{t-1} + m^2_t \tag{2}$$

The manpower stock with secondary education consists of two parts: those already in it one period before and those who have joined it since. The time unit has been chosen equal to six years so as to coincide with the training period of secondary schools. Of those in the labour force (of this educational level) already six years ago, N^2_{t-1}, a portion λ^2 has dropped out by death or retirement.

$$m^2_t = n^2_{t-1} - n^3_t \tag{3}$$

The labour force (at level 2 of education) added these last six years equals the secondary school population six years before, minus the numbers now in third-level education.

$$n^3_t = n^3_{t-1} \tag{4}$$

Similarly, the numbers of third level who joined the third-level labour force these last six years are equal to the student population six years ago: we assume that university training also takes 6 years.

$$N^3_t = (1 - \lambda^3)\ N^3_{t-1} + m^3_t \tag{5}$$

This equation is of the same structure as equation 2 but applies to the labour force with third-level education.

$$N^3_t = \nu^3 v_t + \pi^2 n^2_t + \pi^3 n^3_t \tag{6}$$

This latter labour force consists of (a) those active in production, supposed to be proportional, in numbers, to the volume of production by a coefficient ν^3; (b) those active in secondary education, proportional to the number n^2_t of students by a coefficient π^2, and (c) those active in third-level education, proportional to the number n^3_t of students at that level by a coefficient π^3. The two latter coefficients are the teacher-student ratios of the second and third level, respectively.

The values of the coefficients have been derived from United States experience but are meant only as indications of orders of magnitude. Expressing production in billions of dollars (of 19 . . buying power) and population in millions, approximative values are:

$$\nu^2 = 0.2 \qquad \nu^3 = 0.02$$

The coefficients λ^2 and λ^3 are ratios of 'disappearance' per time unit. Somewhat arbitrarily they have been taken equal to 0.1, having in mind that population grows.

The teacher-student ratios π^2 and π^3 have been taken equal to 0.04 and 0.08 respectively.

Patterns of balanced growth (Problem 1)

The system of equations of our model is a system of linear difference equations. Their solutions consist of several components; these representing fluctuations are not relevant to our problems. There is one—and only one—component showing a smooth development, which can be ascertained by assuming an exponential development over time. In order that the system moves along such lines, the initial conditions (to be indicated by a suffix $t = 0$) have to satisfy certain conditions. We will establish these conditions for two different rates of development of the economy, represented by underlined and by barred symbols, respectively:

$$\text{(A)} \quad \underline{v}_t = \underline{v}_0\, 1.3^t \qquad \text{(B)} \quad \bar{v}_t = \bar{v}_0\, 1.4^t$$

These two paths are characterized by an increase of production by 30 per cent per six-year period and by 40 per cent per six-year period respectively.
In case A we introduce the assumptions:

$$\underline{N}_t^2 = \underline{N}_0^2 1.3^t;\ \underline{N}_t^3 = \underline{N}_0^3 1.3^t;\ \underline{n}_t^2 = \underline{n}_0^2 1.3^t;\ \underline{n}_t^3 = \underline{n}_0^3 1.3^t;\ \underline{m}_t^2 = \underline{m}_0^2 1.3^t$$

and $\underline{m}_t^3 = \underline{m}_0^3 1.3^t$

and substitute these into the equations 1-6. We will find the following conditions to be fulfilled by the initial values:

$$\underline{N}_0^2 = 0.2\ v_0;\ \underline{N}_0^3 = 0.0245\ v_0;\ \underline{n}_0^2 = 0.094\, v_0;\ \underline{n}_0^3 = 0.0098\ v_0;$$

$$\underline{m}_0^2 = 0.062\ v_0;\ \underline{m}_0^3 = 0.0076\ v_0.$$

These relations determine the structure (i.e. the proportions) of the educational system as well as its absolute level. We can carry out the same calculations for

Table I *Balanced growth of the educational system for two growth rates: (*A*) 30 per cent and (*B*) 40 per cent per 6 years. (Production in billions of 19 . . dollars; populations in millions)*

Symbols	Case	A: 30 per cent				B: 40 per cent			
		Time periods t				Time periods t			
		0	1	2	3	0	1	2	3
v	Volume of production	100	130	169	219	100	140	196	274
N^2	Manpower with secondary education	20.0	26.0	33.7	43.7	20.0	28.0	39.2	54.8
N^3	Manpower with third-level education	2.45	3.19	4.14	5.35	2.57	3.60	5.02	7.03
n^2	Students in secondary schools	9.4	12.2	15.8	20.5	12.0	16.8	23.5	32.9
n^3	Students in third level	0.98	1.27	1.65	2.15	1.29	1.80	2.54	3.53
m^2	Manpower with secondary education less than 6 years employed	6.2	8.0	10.5	13.6	7.2	10.1	14.1	19.8
m^3	Manpower with third-level education less than 6 years' employed	0.76	0.98	1.27	1.66	0.93	1.29	1.80	2.54

case B and we will find other relations which must be fulfilled. The two sets of figures are compared in Table I where the initial volume of production v_0 has been taken equal to 100; moreover, the development of the variables over the first few time units has been added.

The table illustrates the relationship between the rate of growth and the structure of the educational system. While the total manpower with secondary education is the same for $t = 0$ in both cases, total manpower with third-level education must be higher in case B, since more teachers are needed. These are needed because the annual addition to trained manpower (of both levels) must now be larger.

Transition problems; with foreign aid (Problem 2)

We now assume that a country wants to step up its economic development. Let it be at time $t = 0$ in the balanced position corresponding with the rate of growth A (30 per cent per 6 years) and let it aim at reaching the path B. This requires increases in the numbers to be trained at levels 2 and 3, but in such a way as to fit into the new pattern of development. Temporarily some of the equations cannot be fulfilled; for if they were all the time, the economy would continue to move along path A. Mathematically this means that either some new terms have to be added to some equations for some time or that some of the existing coefficients have temporarily to be changed. The former adjustment can be interpreted as foreign aid in the form of additional trained manpower becoming available. The latter type of adjustment can be seen as a change in technology (of either the production process or the education process) equivalent to self-help of the country concerned. We will discuss the former case in this section.

An open question, in both problems, is the one of the length of the transition or adaptation period. Generally speaking it can be made shorter by applying more 'instruments' simultaneously; but the structure of the equations sets limits to the possibilities. We will inquire first, in both cases, whether the briefest period of transition, namely one time unit (of six years) is a possibility. It will appear to be possible in the case of foreign aid, but not in that of self-help. This is so because in the latter case the additional training takes time.

The method of analysis consists of writing down for a series of consecutive time periods our system of equations and to find out how many unknowns are available and how many are needed in order to make the system determinate but not overdeterminate (this would mean that inconsistencies slip in). For $t = 0$ all variables must be equal to the values shown in Table I, case A. If the transition period T is equal to one, for $t = 2$ all variables must have the values shown in Table I, case B. It is only for $t = 1$ that we do not know the values of all the variables. We do know, however, the values of those variables for $t = 1$ which appear in the equations for $t = 2$. These have to be equal to the values on path B, otherwise the system would not after $t = 2$ remain on that path. The variables are N_1^2, appearing in equation 2 for $t = 2$, n_1^2, appearing in equation 3, n_1^3, appearing in equation 4, and N_1^3, appearing in equation 5. All these variables must have the 'barred' values (meaning that they belong to path B):

$$N_1^2 = \bar{N}_1^2 \tag{7}$$

$$n_1^2 = \bar{n}_1^2 \tag{8}$$

$$n_1^3 = \bar{n}_1^3 \tag{9}$$

$$N_1^3 = \bar{N}_1^3 \tag{10}$$

This leaves us with the following unknowns in the system of equations for $t = 1$: v_1, m_1^2, m_1^3, and the two additive terms to be added, indicating foreign supplies of trained manpower of second and third level. Indicating imported manpower by i_1^2 and i_1^3, respectively, we obtain the following equations:

$$\bar{N}_1^2 = 0.2\ v_1 \tag{1_1}$$

$$\bar{N}_1^2 = 0.9\,\underset{\sim}{N}_0^2 + m_1^2 \tag{2_1}$$

$$m_1^2 = \underset{\sim}{n}_0^2 - \bar{n}_1^3 + i_1^2 \tag{3_1}$$

$$m_1^3 = \underset{\sim}{n}_0^3 + i_1^3 \tag{4_1}$$

$$\bar{N}_1^3 = 0.9\,\underset{\sim}{N}_0^3 + m_1^3 \tag{5_1}$$

$$\bar{N}_1^3 = 0.02\ v_1 + 0.04\,\bar{n}_1^2 + 0.08\,\bar{n}_1^3 \tag{6 }$$

The system happens to be determinate and not overdeterminate for the particular reason that the value of v_1 satisfying equation 1_1, namely $\bar{v}_1$, also satisfies equation 6_1; these two equations are dependent. The other four unknowns can be solved from equations 2^1 to 5^1. The solutions are:

$$m_1^3 = \bar{N}_1^3 - 0.9\,\underset{\sim}{N}_0^3 \quad = 3.60 - 2.20 = 1.40\text{, a rise by 84 per cent.}$$

$$i_1^3 = m_1^3 - \underset{\sim}{n}_0^3 \quad = 1.40 - 0.98 = 0.42\text{, i.e. 30 per cent of } m_1^3.$$

$$m_1^2 = \bar{N}_1^2 - 0.9\,\underset{\sim}{N}_0^2 \quad = 28 - 18 = 10\text{, a rise by 61 per cent.}$$

$$i_1^2 = \bar{n}_1^3 - \underset{\sim}{n}_0^2 + m_1^2 \quad = 1.80 - 9.4 + 10 = 2.4\text{, i.e. 24 per cent of } m_1^2.$$

It appears, therefore, that with foreign assistance amounting to 30 per cent of the newly-engaged third-level and to 24 per cent of the newly-engaged second-level labour force the transition period can be restricted to six years. It is assumed, however, that this foreign manpower will remain in the labour force.

Transition problems; without foreign aid (Problem 3)

From equations 1_1 to 6_1 (above) it can be seen that without foreign aid the transition problem cannot be solved in one time period only, at least if our model is adhered to. The possible new unknowns we may introduce are the coefficients appearing in equations 1_1 and 6_1 only; the coefficients of equations

2_1 and 5_1 can hardly be changed. Now if we leave out i_1^2 and i_1^3 as variables, equations 2_1 and 3_1 contain only one unknown and so do equations 4_1 and 5_1 The problem thus cannot be solved. We must assume $T = 2$, implying that we must now consider given the (underlined) values of the variables for $t = 0$ and the (barred) values of the variables for $t = 3$ (corresponding with path B) and use the equations for both $t = 1$ and $t = 2$. From the equations for $t = 3$ we can again derive that $N_2^2 = \overline{N}_2^2; N_2^3 = \overline{N}_2^3; n_2^2 = \bar{n}_2^2; n_2^3 = \bar{n}_2^3$. We are left with the following equations:

(1) $N_1^2 = \nu_1^2 v_1$

(2) $N_1^2 = 0.9\,\underline{N}_0^2 + m_1^2$

(3) $m_1^2 = \underline{n}_0^2 - n_1^3$

(4) $m_1^3 = \underline{n}_0^3$

(5) $N_1^3 = 0.9\,\underline{N}_0^3 + m_1^3$

(6) $N_1^3 = \nu_1^3 v_1 + \pi_1^2 n_1^2 + \pi_1^3 n_1^3$

(11) $\bar{N}_2^2 = \nu_2^2 v_2$

(12) $\bar{N}_2^2 = 0.9\,N_1^2 + m_2^2$

(13) $m_2^2 = n_1^2 - \bar{n}_2^3$

(14) $m_2^3 = n_1^3$

(15) $\bar{N}_2^3 = 0.9\,N_1^3 + m_2^3$

(16) $\bar{N}_2^3 = \nu_2^3 v_2 + \pi_2^2 \bar{n}_2^2 + \pi_2^3 \bar{n}_2^3$

We have used the Greek symbols for the coefficients now, indicating that they may have to be unknowns now and by adding a suffix 1 or 2 we have even introduced the possibility that their values may be different for the two transition periods.

It will be clear that there are several possibilities now, since the total number of possible unknowns—being 18—surpasses the number of equations. We will try to find the simplest possible solution, keeping as many coefficients as possible equal to their normal values. Since there are several equations containing only one unknown, we may first solve these. With these unknowns solved there are more equations only containing one unknown.

From equation 4 we find $m_1^3 = \underline{n}_0^3 = 0.98$.

From equation 5 we find $N_1^3 = 0.9\,\underline{N}_0^3 + \underline{n}_0^3 = 3.19$.

These results enable us to find, from equation 15, $m_3^2 = \bar{N}_2^3 - 0.9\,N_1^3 = 2.16$ and from 14, $n_1^3 = m_2^3 = 2.16$. Again we can now determine, with the aid of 3, $m_1^2 = \underline{n}_0^2 - n_1^3 = 7.24$, and from 2, $N_1^2 = m_1^2 + 0.9\,\underline{N}_0^2 = 25.24$. This further yields us, from 12, $m_2^2 = \bar{N}_2^2 - 0.9\,N_1^2 = 16.5$, and from 13, $n_1^2 = m_2^2 + \bar{n}_2^3 = 19.0$. We are now left with equations 11, 16, 1 and 6. The simplest possibility seems to take $v_2 = \bar{v}_2$ which satisfies 11 and 16 without any change in coefficients and also to leave ν_1^2 unchanged $= 0.2$. This makes $v_1 = \frac{\underline{N}_1^2}{0.2} = 126.2$. The changes in coefficients must now be concentrated in equation 6; with the normal values of these coefficients, the right-hand side amounts to 3.45, while the left-hand side is 3.19; the difference being 0.26.

We must now reduce one or more of the coefficients ν^3, π^2, and π^3. We could not change π^3 only, because it would have to become negative. We could change π^2 only; this would imply a reduction in the ratio of $\frac{0.26}{0.76}$ or 34 per cent (0.76 being the value of the second term with the normal value of π^2). We could also change ν^3 and here the reduction ought to be $\frac{0.26}{2.52}$ or 10 per cent. We may state therefore that the *problem of transition can be solved without foreign assistance by either reducing the teacher-pupil ratio in secondary education by 34 per cent, or reducing the use of third-level manpower in production by 10 per cent both during six years;* another possibility being *a reduction of teacher-pupil ratios in the second and third levels and the third-level manpower ratio in production, all by 7.5 per cent* $\left(\frac{0.26}{3.45}\right)$. Weighted combinations of these possibilities are also possible. The values of the variables (in the restricted sense) in all these cases will be as indicated in Table II.

Table II *Values of variables during period $0 \leq t \leq 3$ (units as before)*

Symbols	Case	II With foreign assistance Time periods t 0	1	2	3	III Without foreign assistance Time periods t 0	1	2	3
N^2	Manpower with secondary education	20	28	39.2	54.8	20	25.2	39.2	54.8
N^3	Manpower with third-level education	2.45	3.60	5.03	7.03	2.45	3.19	5.03	7.03
n^2	Students in secondary schools	9.4	16.8	23.5	32.9	9.4	19.0	23.5	32.9
n^3	Students in third level	0.98	1.80	2.54	3.53	0.98	2.16	2.54	3.53
m^2	'New' manpower: second-level education	6.2	10.0	14.1	19.8	6.2	7.2	16.5	19.8
m^3	'New' manpower: third-level education	0.76	1.40	1.80	2.54	0.76	0.98	2.16	2.54
ν	Production	100	140	196	274	100	126	196	274

A few comments seem to be useful. We see that, because of the foreign assistance in manpower, case II shows, at $t = 1$, a higher stock of manpower of both levels than case III, reflected also in the 'new' manpower, that is, the labour force less than six years employed. The number of students, at both levels, can be lower, in case II, because there will be less need for them when they are ready: the increase in the stock of manpower of their type needed will then be less than in case III. This is a consequence, however, of the implicit assumption in our case II, that the foreign manpower will remain in the labour force until the age of retirement.

Concluding remarks: further research

This article intends to show the use of the models introduced by a few examples. These examples do not, of course, exhaust the possibilities. Thus, the problem could be solved what must be done if the foreign manpower imported during time period 1 will only stay for one period. We have seen that alternative methods of adaptation without foreign aid can also be studied with the aid of our model. It goes without saying that much further research is desirable. The coefficients may be estimated for a number of different countries. The structure of the model may be refined in an almost endless number of ways: by introducing more types of production and more kinds of education. Numerous factors influencing both the demand for and the supply of trained labour may be introduced explicitly. The authors hope that this article will stimulate some of these kinds of generalizations.

II. Examples of tables to be used for education planning

In this appendix a set of tables is presented constituting an example of a planning set-up for education. They give shape to a systematic series of calculations needed for such planning. Since they are examples only they will not necessarily cover the details of any particular country and they may have to be adapted to the special needs of some countries. They are believed, nonetheless, to be a useful framework for a majority of countries. They have flexibility mainly in the number of years and the number of occupational-educational groups they cover. Examples of lists of such groups can be found in some tables in the text. They do not give 'standard values' for the coefficients they use. Such standard values should be derived from the educational statistics of the country concerned or of comparable countries. Considerable quantities of such figures can be derived from Unesco publications. As indicated in the text, short-term and medium-term planning will require many more details than long-term planning.

Table I *Calculation of manpower needed by sectors*

Sector (Industry)	Production (constant prices, blns bancor)				Manpower-production ratios (mlns/blns bancor)				Total manpower per sector (millions)			
	1963	1964	1965	1966	1963	1964	1965	1966	1963	1964	1965	1966
1	11	12	13	14	21	22	23	24	31	32	33	34
1. Metal industry	20	21	22	23	0.100	0.098	0.096	0.094	2.00			
2. Building, etc.	32	33	34	35	0.200	0.196	0.192	0.188	6.40			

Sources:

Columns 11-14: to be taken from Plan.

Column 21: to be taken from statistics for base year, corrected if base year is not 1963.

Columns 22-24: in this example, increase of productivity of 2 per cent per annum has been assumed. Figures may be different and may also differ between sectors (cf. 'Manpower requirements by sector of production', p. 183, for alternatives).

Columns 31-34: found by multiplying column 11 by column 21, 12 by 22, 13 by 23, etc.

Table II *Calculation of stock of manpower needed by occupational-educational groups, for sector No. 2 of Table I*

Occupation symbol	Education symbol	Percentage of total manpower of sector				Stock of manpower needed for occupation-education groups of sector 2 (thousands)			
		1963	1964	1965	1966	1963	1964	1965	1966
1	2	11	12	13	14	21	22	23	24
		%	%	%	%				
834	721	10	11	12	13	640			
	722	12	11	10	9	768			
	734	4	4.5	5	5.5	256			
835	723	5	5	5	5	320			
	736	2	2.2	2.4	2.6	128			
etc.	etc.								

Sources:

Column 1: taken from a census or similar source and supposed to list occupations in sector 2.

Column 2: taken from special inquiries about educational background of occupation mentioned in column 1. It has been assumed that occupation 834 can be taken by those having either education 721, or 722, or 734, etc.

Column 11: taken from same inquiry.

Columns 12-14: may be based on observed trends or on inside information.

Column 21: found by multiplying figure from column 31 of Table I by column 11.

Column 22: multiplication of column 32 of Table I by column 12.

Column 23: multiplication of column 33 of Table I by column 13, etc.

Table III *Calculation of mortality and retirement (census year)*

Sector, occupation and education	Manpower age distribution (numbers)					Mortality rates (per 1,000)				Retirement rate	Number of deaths				Numbers retried	Total, deaths and retirement
	15-39 (A)	40-49 (B)	50-59 (C)	60-64 (D)	Total	A	B	D	C		A	B	C	D		
1	11	12	13	14	15	21	22	23	24	25	31	32	33	34	35	36
3; 875; 113, etc.	1 650	600	450	150	2 850	1.0	3.0	6.0	15.0	20	1.7	1.8	2.7	2.2	57.0	65.4

Sources:
Columns 11-15: from census. If no figures about precisely the group considered are available, a comparable group is taken.
Columns 21-24: can be taken from census or from insurance data.
Column 25: may be taken equal to proportion of manpower at the age of 64; if possible, an estimate of shifts to other occupations must be added.
Columns 31-34: obtained by multiplying column 11 by column 21, 12 by 22, etc.
Column 35: obtained by multiplication of column 15 by column 25.
Column 36: total of columns 31-35.

Table IV *Calculation of new entrants for each educational group*

Sector, occupation and education	Manpower stock needed at beginning of years:				Increase in manpower stock needed during			Numbers retiring and deaths			New entrants required in years		
	1963	1964	1965	1966	1963	1964	1965	1963	1964	1965	1963	1964	1965
1	11	12	13	14	21	22	23	31	32	33	41	42	43
3; 875; 113	3 135	3 407	3 695	4 005	272	288	310	72	78	85	200	210	225

Sources:

Column 11: to be obtained by taking average of manpower stock for the years 1962 and 1963.

Columns 12-14: calculated in analogous manner.

Column 21: difference between columns 12 and 11.

Column 22: difference between columns 13 and 12, etc.

Column 31: since stock at beginning of 1963 is 10 per cent higher than in census year (cf. Table III), retirement and deaths are also taken 10 per cent higher.

Columns 32, 33: for first few years, increases proportional to columns 12 and 13 can be taken. For long-term forecasts Table III must be calculated anew by demographic methods (projection of age distribution and estimation of future death rates, etc.)

Table V *Numbers of students (trainees) required in each grade (year) of training, to be calculated for each 'education'*

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Starting (S) or finishing (F) grade	Normal development of number of students	Numbers of students (trainees) required									Actual numbers for 1963	Deficit (—) or surplus (+)
		1959	1960	1961	1962	1963	1964	1965	1966	1967		
1	2	3	4	5	6	7	8	9	10	11	12	13
S 1	100	*250*	263	281	313	325					320	— 5
S 2	95		*238*	250	267	296	309				280	—16
S 3	90			*225*	236	254	281	293			240	—14
S 4	85				*213*	224	239	266	277		200	—24
F 4	80					*200*	210	225	250	260	190	—10

Sources:

Column 1: contains as many lines as there are grades (or years) in the education, plus 1 (the number of grades is taken only to 4 in order to keep table small).

Column 2: to be derived from education statistics, if available, or from experts in this type of education.

Column 3 and following: deduced from lowest line, in which figures of 'finished' manpower (or entrants into occupation) are taken from columns 41, 42, 43 etc. of Table IV. *Italic* figures refer to generation which must be ready in 1963; their proportions coincide with proportions of column 2.

Column 12: is taken from statistics, if available, or else from statistics for earlier year (1962, or 1961, for instance) by the application of proportions in column 2. Thus, if for 1962 the numbers starting grade 4 are known, they must be reduced in the ratio 80/85 in order to arrive at an estimate of the numbers who will finish in 1963.

Column 13: is the difference between columns 12 and 7.

Table VI *Survey for occupation 834, assuming that educations 721, 722 and 734 are only supplying manpower for occupation 834 (year 1963)*

Education	Length of education	Stage reached by students to be ready in 1965	Numbers		Stage reached by students to be ready in 1967	Numbers	
			Expected	Required		Expected	Required
1	2	3	4	5	6	7	8
721	4	Starting third grade	240	.	Starting course	320	360
722	4	Starting third grade	300	.	Starting course	400	440
734	2	Starting course		x	Not yet involved	.	50
Total numbers required			.	700		.	850

Sources:

Column 1: must contain all educations needed for occupation.

Column 2: obtained from education information.

Columns 3, 6: self-explanatory.

Column 4: to be taken from statistics as explained in Table V, column 12.

Column 5: to be taken from Table V, column 7, line S 3 for educations 721, 722 and 734, added up. Figure x is unknown and must be taken $x = 700 — 540$ (cf. 'Short-term and medium-term adaptations in education, p. 200).

Column 7: to be taken from statistics as explained under 'Longer-term adaptations in education', p. 202.

Column 8: to be taken from Table V, column 7, line S 1 for educations 721 and 722. Measures must be designed to raise the figures 320 and 400 of column 7 to figures 360 and 440 of column 8.

Table VII *Planning for general education: secondary school, type B. Estimation of number of new entrants required in 1964*

Educations using school type B	Length of education after admission to B (years)	New entrants		Total loss after 1964 (nos.)		Numbers required in 1964
		Year	No.	School B	Later	
1	2	3	4	5	6	7
210	8	1972	250	120	50	420
211	10	1974	300	150	150	600
215	12	1976	150	80	100	330
223	9	1973	200	90	60	350
227	8	1972	1 040	300	120	1 460
228	7	1971	2 485	680	120	3 285
240	6	1970	5 575	1 700	.	7 275
Available from 'losses'	.	.	.	.	— 500	— 500
Total required in 1964	.	.	.	.	.	13 220

Sources:
Column 1: all educations using school type B.
Columns 2, 3: from education information.
Column 4: from Table IV, for each type of education and year stated in column 3.
Columns 5, 6: from data as given in column 2 of Table V, for each education.
Column 7: equals sum of columns 4, 5 and 6. For negative figure see explanation in text, p. 204.

III. Short reading list on economic planning

General

1. *Programming techniques for economic development, report by a group of experts*. Bangkok, United Nations, Economic Commission for Asia and the Far East, 1960.
   Development programming techniques series, no. 1.
   (Sales no. 60. II. F. 3).
2. *Formulating industrial development programmes, report by a group of experts*. Bangkok, United Nations, Economic Commission for Asia and the Far East, 1961.
   Development programming techniques series, no. 2.
   (Sales no. 61.II.F.7).
3. *Europe's future in figures*, edited by R.C.Geary, ASEPELT (Association scientifique européenne pour la prévision économique à moyen et à long terme). Vol. I, Amsterdam, North-Holland Publishing Company, 1962.

Regional plans

4. See 1 above, chapter VI.
5. TINBERGEN, J. Simple devices for development planning, paper presented at the Vienna Conference of the International Economic Association, 1962; section 5.

Manpower and education

6. See 1 above, chapter VIII.
7. *International Seminar on Employment Forecasting Techniques, Brussels, 1962*. Paris, Organization for Economic Co-operation and Development, 1962.

Chapter X

Statistics needed for educational planning

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Introduction

The importance and role of statistics in educational planning

In the process of educational planning collection and analysis of relevant statistical information concerning the educational system and related socio-economic factors forms one of the basic elements, as providing the quantitative foundation for projections regarding the future development of the educational organization. This chapter will give a presentation of the more important types of statistical data which may be required in various phases of educational planning. Before going on to a more extensive review of the subject, it might be appropriate to say a few words about the importance and role of statistics in general for the planning of educational programmes.

It is obvious that the quantitative statistical approach is of the utmost importance in educational planning. The dimensions of the future educational system have direct and significant financial implications. All projects for improvement and expansion of the educational system must, of course, be properly costed, before the policy-making authorities can take their final decisions. The reliability of such figures on the future costs of education naturally depends on the adequacy and accuracy of the collected data and the statistical skill and competence displayed in analysing the material and performing the required calculations and projections. It is therefore extremely important that all possible efforts are made to broaden and improve the basic statistical information to be used for educational planning, and to develop and refine the methodology in this field.

It is not practicable to present standardized procedures regarding the collection and utilization of statistical information, to be universally applied, for the purposes of educational planning. The statistical approach to be adopted depends essentially on the scope and objectives of the planning process. In short-term planning, covering only the next few years, it may be useful to pursue the statistical calculations in great detail and to attempt fairly precise forecasts. In long-term planning; extending to a period of, say, ten or twenty years, the general uncertainty in the basic assumptions is of such a magnitude that detailed and complicated calculations to arrive at precise forecasts are bound to be of dubious value.

Educational planning may also be distinguished as between specialized planning, concentrating on a particular level or type of education, and comprehensive planning, covering all kinds of education at the same time. Again, it may be directed to the needs of particular localities (such as school districts, municipalities or provinces) or be nation-wide in character. It is evident, therefore, that no single standard scheme can be proposed for the choice and treatment of statistical data that would be suitable for all types and purposes of educational planning.

The objectives of this chapter

The present chapter is intended to provide a preliminary inventory of the principal types of statistical information, from different sources, which are needed for the purpose of educational planning at the national level. Bearing in mind the highly diversified character of such planning activities, referred to in the previous section, it is natural that this inventory tends to be somewhat extensive. It must therefore be emphasized that the list presented in the following sections is in no way to be looked upon as obligatory, in its entirety, for each kind of educational planning. Even in the most comprehensive type of planning, detailed calculations and projections cannot be carried out in all conceivable respects and directions, but a concentration of effort on certain essential aspects has to be made. It is thus evident that the listed kinds of statistical data are not all of equal importance in a given case. The order of preference depends naturally very much on the type of educational planning concerned. The choice of the basic information, and the use made of it, is therefore finally a matter of judgement in each particular case, taking into consideration the scope and the specific objectives of the planning activity in question.

Regarding the different types of statistics included, there is a principal distinction between those belonging to educational statistics[1] and those belonging to other fields of statistics.[2] In the first case we deal with data which primarily serve the purpose of educational planning, while the second case refers to statistics used for many different types of economic and social planning. Where educational planning forms an integrated part of an over-all economic and social planning scheme, it may not be equally justified to present a detailed description of the various data needed from the field of demographic, labour force, economic and financial statistics. However, we may not assume that this is the case in all countries, at least for the time being, and it has therefore seemed appropriate to give due attention also to the requirements for statistical data from those fields.

Another consideration of importance is the availability of the data listed. There again, it must be strongly emphasized that the inventory has deliberately been made rather extensive, although it is quite clear that for some of the more intricate types of information listed, no data at all, or very inadequate data, may, for the present, be found in a great number of countries, and that consequently the methods to be used in the planning procedure have had to be appropriately modified. It is particularly true that educational planning in the less developed countries, at least for the time being, has to be carried out with grossly insufficient statistical resources. In such a situation there is naturally no choice. However desirable the various types of statistical information presented in this chapter may be from a methodological point of view, the planning team or authorities have to tackle the difficulties in a realistic approach and make the best possible use of the scarce data available. It seems, therefore, appropriate here to give special attention to the order of priorities among the different types of statistics 'needed' for educational planning, with a view particularly to the present conditions in the less developed areas. The following set of basic data may be considered as a minimum which must be available even in countries with poorly developed statistical services, before any educational planning in its proper sense can be undertaken:

1. Total population by sex and age (corresponds to item A:1 in the complete list; see page 228 et seq.).
2. Some data, or at least estimates, regarding natality and mortality (A:3).
3. Schools, by level and type of education (D:1).
4. Teachers, by level and type of education, and by sex (E:1).
5. Pupils enrolled, by level and type of education, and by sex and grade (G:1).

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[1] Statistics on: educational institutions; teachers; classes; pupils; school buildings; educational testing and vocational guidance; cost of education.

[2] Demographic statistics; labour force statistics; economic and financial statistics.

6. Graduates, by level and type of education, and by sex (G:2, G:5).
7. School buildings, by level and type of education, and by size and type of construction (H:1).
8. Public expenditure on education, by level and type (J:1-3).

It goes without saying that calculations and forecasts which can be undertaken on the basis of such rough and incomplete data must be of a very approximate character. They may, however, still be useful as indicating the magnitude of the problem. In the countries concerned, the needs for expansion of the educational system are as a rule so enormous that the general uncertainty involved in the projections because of insufficient data is of secondary importance in the early stages of development.

Necessary as such a realistic appreciation of the prevailing situation in many countries may be in a short-term perspective, this must not, however, prevent aiming at improved conditions in this respect for the future. It has therefore seemed appropriate to present in this chapter a fairly comprehensive list of statistical data which, from a methodological point of view, are needed, or at least desirable, for the proper preparation of educational planning programmes. Incidentally, this inventory may also be of some use as a guide for a desirable development and improvement of national statistics on education and related fields.

Finally, it should be mentioned that this chapter is in the first instance concerned with a presentation and description of the various kinds of statistics needed for educational planning, and not directly with the methodology of such planning activities. The types of statistics listed, and their shape in detail, have, however, naturally been selected and designed with a view to fitting into possible requirements for various phases of the planning work. To a certain extent allusions to the methodological background will therefore be made in the description of relevant types of data needed, but it is not intended, in the present context, to give a more extensive treatment of methodological problems.

Some definitions and classifications

In order to clarify certain of the more important concepts used in the following description of various kinds of educational statistics required for planning purposes, some definitions and classifications are given below, derived from the Unesco Recommendation concerning the international standardization of educational statistics. For further explanations, reference may be made to the *Manual of Educational Statistics* (Unesco, 1961).

1. Schools, grades and classes

A *school* (educational institution) is a group of pupils (students) of one or more grades organized to receive instruction of a given type and level under one teacher, or under more than one teacher and with an immediate head. (i) A *public school* is a school operated by a public authority (national, federal, state or provincial, or local), whatever the origin of its financial resources. (ii) *A private school* is a school not operated by a public authority, whether or not it receives financial support from such authorities. Private schools may be defined as *aided* or *non-aided,* respectively, according as they derive or do not derive financial support from public authorities.

A *grade* is a stage of instruction usually covered in the course of a school year.

A *class* is a group of pupils (students) who are usually instructed during a school term by a teacher or by several teachers.

2. Levels and types of education

The classification of education by *level* should, as far as possible, be made in the following way:

Education preceding the first level, which provides education for children who are not old enough to enter a school at the first level (e.g., at nursery school, kindergarten, infant school).

Education at the first level, of which the main function is to provide basic instruction in the tools of learning (e.g., at elementary school, primary school).

Education at the second level, based upon at least four years' previous instruction at the first level, and providing general or specialized instruction, or both (e.g., at middle school, secondary school, high school, vocational school, teacher-training school at this level).

Education at the third level, which requires, as a minimum condition of admission, the successful completion of education at the second level, or evidence of the attainment of an equivalent level of knowledge (e.g., at university, teachers' college, higher professional school).

Education which is not usually classified by level should be placed under one of the following headings:

Special education, covering all general or vocational education given to children who are physically handicapped, mentally handicapped, socially maladjusted or are in other special categories.

Other education (not included elsewhere).

Where possible, education at the *second level* should be subdivided by *type* as follows:

General education, which does not aim at preparing the pupils directly for a given trade or occupation. Where appropriate, general education should be further subdivided as follows: (i) *lower stage,* in which general instruction is given, with orientation of pupils according to interests and aptitudes (e.g., at junior middle school, junior secondary school, junior high school); education at this stage may lead to various types of instruction at a higher stage; (ii) *higher stage*, in which some differentiation is provided in the types of instruction according to the interests and aptitudes of the pupil (e.g. at senior middle school, senior secondary school, senior high school).

Vocational education, which aims at preparing the pupils directly for a trade or occupation other than teaching. Where appropriate, vocational education should be further subdivided as follows: (i) education which is mainly *practical*; (ii) education which is mainly *technical and scientific*.

Teacher training, which aims at preparing the pupils directly for teaching.

Education at the *third level* should, as far as possible, be classified by *type* as follows:

Education at universities and equivalent institutions leading to an academic degree.

Teacher education at non-university institutions.

Other education at non-university institutions.

3. Educational attainment and literacy

The *educational attainment* of a person is the highest grade or level of education completed by the person in the educational system of his own or some other State. Whenever possible, distinction should also be made among different types of education at each level.

A person is *literate* who can with understanding both read and write a short simple statement on his everyday life.

Types of statistical data needed for educational planning

Demographic statistics

A:1 *Total population, by sex and age.* One of the essential factors in all educational planning is, of course, adequate statistical information about the structure of the population, to provide the quantitative framework within which the educational development has to be projected and implemented. In the first place figures are needed about the total population of the country, according to the latest census, with a distribution by sex and age. The age classification commonly used in censuses, by five-year groups (0-4 years, 5-9, 10-14, etc.) does not, as a rule, fit in with the normal age limits related to the various levels and types of education in a given country. The relevant age groups (school-age populations) have, therefore, to be estimated by means of interpolation in the standard age classification. If, however, a sufficiently reliable distribution by single-year age groups is available from the original census tables, such detailed data should, of course, be utilized in calculating school-age populations and for projections of school enrolments. In countries where only obsolete census data exist, or where no census has ever been taken, available population estimates might be used, if they are fairly reliable.

For regional planning, separate population data are needed for each administrative district. Data on population density would also be desirable in this connexion. A distinction between urban and rural areas is required because of the basic differences in educational needs between such areas.

Where such an *urban/rural* breakdown is not feasible for certain reasons or is considered inappropriate, it might be advisable to apply the classification recommended by the Conference of European Statisticians.[1] This classification is based on the criterion of size of population and means a subdivision into three broad categories: small localities, medium-sized localities and large localities. The sizes of population used as the dividing lines should approximate as closely as possible to 2,000 in the case of the first two categories and to 10,000 in the case of the second and third. What has been said so far applies also to all other items in the list where a similar breakdown is relevant. For the sake of simplicity we are, however, not going to repeat it in the following, but only refer to a distinction between urban and rural areas.

A:2 *Population projections.* Projections concerning future changes in the population structure are of essential importance for educational planning. In principle it must be assumed that general population projections are made centrally, by the authority responsible for demographic statistics in the country, as such data are also needed for other phases in the integrated process of economic and social planning. Such projections should give the estimated composition of the population, by sex and age, for, let us say, every five years within the next twenty-year period. The specific problem of utilizing the standard classification by five-year age groups for purposes of educational planning has already been discussed under the previous item. Population projections should, where appropriate and possible, be provided also for different regions of the country, particularly with a breakdown into urban and rural areas, as such figures are needed for various purposes of local planning.

A:3 *Natality, mortality and migration.* In cases where centrally-made population projections do not exist, or must be supplemented in certain respects, it is important for the educational planner to have appropriate information about prevailing tendencies in the demographic development of the country, enabling him to make some rough estimates of future changes in the population structure. It is therefore desirable to have information on the number of live births and the crude birth and death rates for a sufficiently long period. A distinction, for the data concerned, between administrative districts, and particularly between urban und rural areas, is of great interest, as it may reveal significant differences in the rate of population growth.

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[1] Annex to the *European Progamme for National Population Censuses* (Conf. Eur. Stats./WG.6/83).

Furthermore, life tables giving, at each year of age, the mortality rate and the expected number of survivors out of 100,000 born alive, are desirable for certain calculations regarding future changes in the school-age population.

Where migration is of any real significance, information merely about birth and death rates is not sufficient for estimating the future growth of the population. Data are also required about the net external migration, with an appropriate age distribution. In cases of regional planning special attention should also be given to internal migration, as far as information is available. Particularly the population movements from rural to urban areas are of great importance in many countries.

Labour force statistics

B:1 *Economically active population, by industry and educational attainment.* The general objective of educational planning, so far as labour force aspects are concerned, must be to establish an educational organization which at a given time is capable of providing the country with an adequate number of each type of qualified manpower, needed for the projected economic and social development. Statistical information about the present structure of the labour force (according to the most recent figures available) is therefore one of the basic requisites for such planning. In the first place, data are required about the economically active population by industry (branch of economic activity). The international standards for classification of industrial categories[1] should be applied as far as possible. How detailed the breakdown should be within this framework depends on the nature and purpose of the planning process and on the data available.

As for educational attainment, it seems as a rule not feasible to have a very detailed classification, sometimes only a breakdown into broad categories may be practicable (e.g., no formal education; completed part of the first level; completed first level; completed first level and part of second level; completed second level; completed second level and part of third level; completed third level). Wherever possible a cross-classification should also be given between the branch of economic activity and educational attainment. This is important for evaluation of the effect of future changes in the industrial structure of the labour force in terms of educational needs. It must, however, be made quite clear in this connexion that the information thus obtained about the educational attainment within various branches of economic activity only represents the actual situation for the time being, as reflecting hitherto prevailing standards and tendencies. It may very well be that in some cases the norms to be used in calculating future needs for skilled manpower may differ essentially from what has so far been an accepted practice.

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[1] *International Standard Industrial Classification of all Economic Activities* (United Nations: Statistical Papers, Series M, No. 4, 1949).

B:2 *Projections of the labour force.* It is quite obvious that the structure foreseen for the future labour force is of outstanding importance for determining the educational needs. Projections based upon certain principal assumptions regarding the future economic pattern of the country should therefore be carried out concerning the changes, say over a twenty-year period, in the economically active population as to the composition by broad industrial groups. The task of undertaking such projections goes, of course, beyond the scope of public statistics and is normally entrusted to the central authority responsible for the over-all economic and social planning in the country, in collaboration with the agencies in charge of demographic and labour force statistics. Where appropriate and feasible, a cross-classification by educational attainment should also be made. In this connexion reference may be made to what has already been said under the previous item, particularly that the future demands for skilled manpower of different kinds must be assessed objectively for the various branches of economic activity, including scientific and technological professions, according to anticipated real needs; they should not be based only on the present, often quite insufficient, supply of qualified personnel. It goes without saying that projections of this kind are extremely complicated, precarious and time-consuming undertakings, and consequently there are, for the time being, probably not many countries which have attempted comprehensive studies of this kind.

Economic and financial statistics

C:1 *Gross national product, indices of economic growth.* The economic resources of a country are naturally of decisive importance in all educational planning, and basic information in this respect is therefore indispensable. In the first place, data on the gross national or domestic product, whichever is used in the country (or other similar figures available), are required, for a sufficient period of time, to elucidate the economic development in broad lines. Due consideration should be given to influences of population changes and variations in the monetary value, e.g. by computing index numbers of *per capita* product at constant prices. If full information about the gross national product, or national income, is not available, other suitable indicators of economic growth might be used, for example industrial production and agricultural production. The type and quality of such information vary greatly between countries, and for the less developed areas it will often be difficult to find adequate data in this connexion.

C:2 *Total public expenditure, by authority and purpose.* Information should be provided about the total expenditure by all kinds of public authorities in the country, central or federal government, provincial or state governments, city, district, or other local authorities. The total public expenditure should furthermore be distributed by purpose, in broad categories, for example social welfare, public health, education, national defence and also by recurring and capital expenditure respectively. Such figures, for a series of years, and in connexion with data under item C:1, illustrate the present position and recent tendencies concerning educational expenditure in the context of public economy. They are therefore extremely important for the integration of educational planning into an over-all economic planning for a country.

Statistics on educational institutions

D:1 *Institutions by level and type of education.* Statistics are required for all types of schools at each level of education: pre-school education, first (primary), second (secondary) and third (higher) level of education. Where appropriate, a breakdown of schools at the second level should not only relate to the three main types—general, vocational and teacher-training schools—but also give a specification of different kinds of vocational schools. Also institutions for special education (for physically or mentally handicapped and socially maladjusted children), and other kinds of education should be reported with a suitable classification. Furthermore, a distinction should be made between public and private institutions. Where co-education is not fully applied, a further breakdown of schools into boys', girls' and mixed schools may prove necessary, as giving the background information for determining future policy of providing educational facilities for boys and girls.

Teachers

E:1 *Number of teachers by sex and age.* These are, naturally, essential data which are required for all levels and types of education separately. The age distribution of the present teaching staff is of special importance for calculations regarding future losses by death and retirement. A single-year distribution for the upper ages would certainly be valuable in cases where a fixed age limit is prescribed for retirement, but in general a breakdown into five-year age groups might be sufficient, e.g., below 20, 20-24, 25-29 . . . 60-64, 65 and above. In many less developed countries where the educational system is still in the first stages of expansion, the great majority of teachers are very young and the question of losses by death and retirement is consequently not very crucial for the time being. In a long-term perspective the age factor must nevertheless be given appropriate attention.

The composition of the teaching staff by sex is of great importance in some countries, since female teachers may have a more restricted serviceability (e.g. in rural areas) and a greater likeliness to leave the profession (in connexion with marriage). Moreover, in cases where co-education is non-existent, or is practised only in a minority of the schools, the sex ratio among teachers is naturally of special significance in all development plans.

E:2 *Teachers by qualification and length of service*. One of the most serious obstacles for the proper development and expansion of school systems in many countries is the shortage of adequately trained teachers. Consequently, information about the actual qualifications of the teachers in service is one of the basic factors in all educational planning. It is, of course, not possible to present a standard classification in this respect. The qualification groups to be chosen in a given case must be adapted to the level and type of education concerned and to the specific conditions in the country. In principle, however, the classification must be detailed enough to allow the distinction not only between those who are *formally* qualified and unqualified, but also within the second category between certain subgroups, such as: (a) persons with absolutely insufficient qualifications (first priority for replacement); (b) persons of a somewhat better standard, passable during a period of transition (second priority for replacement); (c) persons whose educational attainment, though not up to the formal requirements, is fairly acceptable, and who have a valuable practical experience as teachers (a group which may be kept in the teaching force on a permanent basis).

The delimitation and interpretation of these groups in the light of existing types of qualifications must of course be left to the national statisticians and administrators. In this connexion, however, it should be mentioned that a cross-classification of teachers by qualification and years of service (in the educational field) may prove useful. Although the planning of teacher-training programmes in principle aims at replacing all formally unqualified teachers, it is obvious that proper consideration must be given to long service and experience in the teaching profession, for both social and humanitarian reasons.

E:3 *Number of teachers lost to the educational system each year for various reasons*. In order to estimate the future demand for teachers of a certain kind it is not enough to calculate the total number of teachers needed at a given date. One has also to take into account the turnover of the present teaching staff which is likely to occur during the period in question. Methodologically the demand for new teachers is divided into two components, one related to the quantitative expansion of the educational system, the other one to the replacement of current losses to the teaching staff. Therefore data are required concerning the number of teachers of every relevant category who leave the profession each year. Distinction must be made between loss of teachers by death, retirement, transfer to other occupational groups, and other reasons (e.g. women resigning in connexion with marriage and child-bearing.) As female teachers may be subject to particular 'risks' of leaving the profession it is necessary to supply figures separately for the two sexes. In many cases it might also be useful to give a cross-classification with data on age distribution. Changes in the age structure of the teaching force are naturally of great importance for the losses to be expected over a certain period of time.

E:4 *Full-time and part-time teachers, hours of teaching*. In some countries and for certain levels and types of education, part-time teachers play an important role, and in such cases data solely on the number of teachers are not sufficient. More detailed information is required in order to measure the quantity of instruction imparted. Statistics should therefore also be available about the number of full-time and part-time teachers of every relevant level and type, giving at the same time the total number of hours per week taught by each category of teachers. Moreover, for the full-time teachers separate figures should, where appropriate, be given for regular hours (stipulated for the post in question) and extra hours (with additional pay). In all these respects concepts and definitions have, of course, to be adapted to national regulations and customs. With such data at hand it will be possible to convert the number of part-time teachers and also the number of extra hours for full-time teachers into the equivalent of regular full-time teachers. In calculating the future needs for teaching staff it is then possible to allow for changes in the proportions between the three relevant categories of hours of teaching, if the general policy so requires. This may have considerable implications for the planning of teacher-training programmes, because the 'input' for a prospective full-time teacher and part-time teacher is generally the same, while the 'output' may be quite different.

A cross-classification with another set of data for teachers may sometimes be useful. For example, this could be the case with a distribution of teachers by subjects, because the proportion between full-time and part-time teachers may be quite different for theoretical subjects and certain practical subjects, such as handicraft and music.

Classes

F:1 *Number of classes by grade.* The class as a work unit in the school system has a special importance in the planning process because of its close connexion with the two major problems of providing sufficient supplies of both teachers and classrooms. Hence it is necessary to have in the first place data, for all relevant levels and types of education, about the number of classes within each grade (year of study). Special modifications may sometimes be required because of a particular feature in the organizational pattern, e.g. for one- or two-teacher primary schools, where classes cannot be related to single grades but correspond to combinations of grades. As a rule, it is of interest to obtain also a regional distribution, particularly distinguishing between urban and rural areas.

F:2 *Number of classes by size.* The data mentioned in the previous item, in combination with corresponding figures for pupils, will provide the educational planner with average numbers of pupils per class, which are needed for his calculations. The average as such is, however, not sufficient, as it may represent in one case a kind of 'normal' size of classes, around which most of the actual class enrolments cluster within fairly narrow limits, or in another case merely a theoretical centre of gravity in a distribution of high dispersion. As a supplement it is therefore desirable to get information also about the frequency distribution of classes according to number of pupils enrolled (e.g. less than 15, 15-19, 20-24, 25-29, 30-34, 35-39, 40-49, 50-59, 60-79, 80 and over). As conditions vary considerably between countries in this respect, the classification has, of course, to be adapted accordingly. A main concern here should be to devise a sufficiently detailed classification to reveal interesting features regarding extreme values. With such data at his disposal the educational policy maker can in a simple way evaluate the quantitative and financial consequences of different proposals to reduce class size by limiting the number of pupils to a certain maximum. What has been said for the previous item about a regional breakdown of the figures also applies here.

Pupils (students)

G:1 *Number of pupils by sex, age and grade.* One of the essential requirements for all educational planning is, of course, adequate statistical information, for each level and type of education, regarding the number of pupils enrolled by sex, age, and grade (year of study). A cross-classification of age and grade should be undertaken, especially in cases where the age dispersion within the grades is considerable. By relating such data to available statistics about the total population in the relevant age groups, enrolment ratios can be obtained which indicate the relative coverage of the various kinds of education and may be used as a basis for school enrolment projections.

In cases where the private sector of education plays an important role, it might also be necessary to maintain a permanent distinction between public and private schools.

G:2 *Pupils at the first and second levels of education leaving school each year*. Information of this kind aims principally at evaluating the results achieved in the educational system and should therefore in the first instance distinguish between pupils who leave school after having successfully passed the final examination (for a certificate or diploma), or after having completed the full course of study, and those who leave school prematurely. Such data should be compiled yearly for each relevant kind of education, giving numbers of school leavers by grade, sex and age (and, where applicable, by branch of study, cf. item G:4). The problem of 'drop outs' is of special importance in some countries and deserves proper attention in the planning procedure because of its economic consequences.

G:3 *Pupils repeating grades each year*. One of the indicators of the efficiency of a school organization is the number of pupils repeating grades each year, which besides the number of premature school leavers (see the previous item) represents one of the two principal elements of 'wastage' in a school system. Statistical data should therefore be compiled for all relevant kinds of education regarding the number of pupils repeating grades, distinguishing by sex, age, and grade. Where differentiation exists in secondary education, a distinction should also be made between the various branches of study. With the data thus provided, the 'wastage' of school facilities might be evaluated and the necessary steps taken in order to achieve a more efficacious and rational organization and operation of the educational system.

G:4 *Pupils at the second level of education by branch of study*. Often some differentiation is provided in general education at the second level, particularly in the upper grades, according to the interests and aptitudes of the pupils. The actual choice made for the pupils between available branches of study (combinations of subjects) is of crucial importance for their further studies and/or career, and thereby for the future supply of qualified manpower. Hence, where such differentiation exists, it is essential for educational planning to have, for the relevant grades of secondary education, a distribution of the pupils by branch of study. As the choice of branch usually is rather different for boys and girls, a cross-classification by sex should also be given.

Similarly, in vocational education at the second level a distribution of the pupils according to all significant branches of specialization should also be provided. Where courses of different length exist for the same speciality, some suitable classification by duration of study would also be of interest.

G:5 *Students at the third level of education by field of study.* As the demand for and supply of scientific and technical personnel play an especially important role in all educational planning, it is necessary to have detailed information about specialization of students in higher education. Data should consequently be collected about the number of students enrolled in different types of education at the third level (universities, teacher-training colleges and other higher professional schools) with a distribution by field of study. The classification to be used depends, of course, on the type and purpose of the planning procedure as well as on the special conditions of the country. As a first broad classification, adaptable for further breakdown to the degree of precision desirable in each case, one could possibly follow the distribution by major fields of study used by Unesco, namely:

Humanities: archaeology, history, languages, letters, library science, philosophy, psychology, theology, and similar subjects;
Education: education, pedagogy, physical education;
Fine arts: architecture, drawing, music, painting, sculpture, speech and dramatic arts, and similar subjects;
Social sciences: banking, commerce, diplomacy, economics, ethnology, geography, home economics, international relations, journalism, political science, public administration, social welfare, sociology, statistics, and similar subjects;
Natural sciences: astronomy, bacteriology, biochemistry, biology, botany, chemistry, entomology, geology, geophysics, mathematics, meteorology, mineralogy, physics, zoology, and similar subjects;
Engineering: applied science, construction, geodesy, metallurgy, mining, surveying, technology, textiles, and similar subjects;
Medical science: anatomy, dentistry, medicine, midwifery, nursing, optometry, osteopathy, pharmacy, physiotherapy, public health, and similar subjects;
Agriculture: dairying, fisheries, forestry, horticulture, rural science, veterinary medicine, and similar subjects;
Other fields.

Separate figures should be given for male and female students, as the choice of specialization generally differs considerably between the two sexes.

In countries where foreign students are present in significant numbers, separate records should be kept because they normally do not constitute a direct manpower resource for the country in question.

G:6 *Graduates at the third level of education, by field of study, level and type of degree or diploma.* The output of universities, higher professional schools, etc., is undoubtedly one of the most crucial elements in all integrated planning for the economic and social development of a country. Adequate and sufficiently detailed data are therefore required concerning the number of graduates each year from institutions at the third level, distinguishing between various fields of study and different levels and types of degrees and diplomas. What has been said about classification under the previous item applies in general also in this case. A distinction between the two sexes is of particular significance here, because as a rule one has to assume different rates of accession and losses to the professions concerned for male and female graduates.

Where the length of courses is not fixed by special regulations, a cross-classification by duration of study should also be undertaken, as the time element is of great importance for calculations regarding the future supply of qualified manpower.

G:7 *First-time students at the third level of education, by field of study.* In order to follow more directly current tendencies regarding the influx of students into higher education and their choice of specialization, it is desirable to have at one's disposal adequate information about first-time students, that is to say students who, during the academic year in question, are for the first time enrolled in an institution of higher education. Regarding classification, the same principles should be followed as in items G:5 and G:6. Such data, together with information concerning duration of study, would enable the planner to investigate more closely the relationship between admission policy and examination results over a certain period of time, and consequently also to estimate the future supply of scientific and technical personnel from the observed and expected inflow of students.

G:8 *Full-time and part-time pupils.* For sectors of the educational system where full-time and part-time instruction exist side by side, a further classification of pupils into full-time and part-time pupils should be undertaken. This is particularly the case for certain kinds of vocational schools. Furthermore, such schools often provide a variety of courses of different length, and therefore it may sometimes also be desirable to classify the pupils according to duration of the course. In both cases it is a question of factors which ought to be properly considered in the planning procedure, as bearing upon the quantity of education provided and having their particular economic implications.

G:9 *Students abroad, by country, field and duration of study.* For countries with insufficient or no facilities for higher education, the number of students who study abroad plays an important role in all educational planning. Data are required about the number of students enrolled in institutions at the third level outside the country, with, as far as possible, a distribution by field and duration of study, by sex, and by country of study. To obtain adequate and reliable statistics of this kind is certainly not easy, as they relate to circumstances which are often not under the complete control of the national authorities concerned. In some cases it may be necessary to use an indirect method of compiling such data, namely by referring to statistics on foreign students in higher education for the relevant countries of study. Wherever feasible, information should be collected showing not only the total number of students but also graduates and first-time students abroad.

School buildings

H:1 *School buildings by type of construction, qualitative standards, and size.* As educational planning also involves programmes for the future supply of well adapted premises for the school system, it is necessary to have adequate statistical information about the present position in this respect. Data should therefore be gathered for the relevant levels and types of education regarding the number of school buildings, with a distribution by type of construction and general standard. The details of the classification must, of course, be adapted to the particular conditions of the country, but, according to types of construction, buildings could, for example, be divided into brick, wood, mud houses, etc. As for the qualitative standard they might be characterized into different categories of suitability for school purposes. Information is needed about the size of school buildings, by means of a distribution according to the number of classrooms and places contained, and their utilization.

H:2 *Classrooms and special rooms.* Data should be provided for the different levels and types of education concerning the number and capacity of classrooms and rooms for special purposes, such as laboratories, handicraft rooms, gymnasiums, libraries, etc. As the lack of classrooms is one of the major problems in educational programming in many countries, it is also necessary to elucidate the various manifestations of this shortage. The total number of classrooms should therefore be divided into two categories, namely *proper classrooms,* originally intended for this purposes, and *provisional classrooms,* not originally designed as classrooms but for the present used as such because of an emergency situation. Within each of these two groups a distinction ought further to be made between classrooms utilized exclusively by one class, and classrooms shared by two or more classes, simultaneously or alternately. Such data, if properly specified, will enable the planner to calculate, besides the needs for new classrooms due to the educational expansion, also the additional number required to meet the shortage of classrooms already existing within the school system.

Educational testing and vocational guidance

I:1 *Evaluation of pupils' achievement*. Achievement test results, at regular intervals, from standardized tests enable the educational planner to evaluate the efficiency of various teaching methods, curricula, etc. These, in conjunction with mental, aptitude and interest tests are invaluable in improving and perfecting testing and guidance programmes.

I:2 *Measurements of pupils' aptitudes and interests*. The aptitude and interests of pupils should be measured at regular intervals throughout the school life of the pupil. These tests should be standardized and, if possible, related to similar tests conducted by industry among various professional and occupational groups. Such testing programmes serve not only as an aid in curricular planning but in vocational guidance programmes as part of educational planning for future manpower requirements.

Costs of education

J:1 *Recurring expenditure on education by public authorities*. One of the most important phases in educational planning is the costing of the projected development, and detailed statistical information is therefore necessary about the present situation as to educational expenditure of various kinds. In the first place, data are required concerning recurring expenditure on *education* by various kinds of public authorities: central or federal government, provincial or state governments, city, districts or other local authorities. (The total expenditure, for *all purposes*, by public authorities, is given in item C:2, presenting the budgetary framework within which the public expenditure on education is integrated.) The public expenditure on education should also be distributed, on the one hand, by categories of expenditure such as administration, instruction, maintenance and supplies, auxiliary services, etc., and on the other hand by levels and types of education. Especially the latter kind of data are of great importance in providing the planner with per pupil costs for the various kinds of schools, to be used in estimating the operational costs of a projected educational programme. It should be noted that national patterns of financing the school organization vary considerably, and that existing peculiarities in the given case must be taken into consideration when utilizing data of the suggested type for cost estimations. As an example, it might here be mentioned that some countries provide a system of subsidies for educational purposes from the central government to local authorities, which system, if not properly allowed for, may lead to a certain amount of double-counting in the global expenditure figures.

J:2 *Capital expenditure on education.* To throw light upon the present situation regarding capital investments in the educational field, data are needed about expenditures by various public authorities for construction of school buildings (including costs for sites) and for purchase of durable equipment. It seems appropriate to distinguish between expenditure for *purely educational facilities,* such as school buildings, classrooms, laboratory and work-shop equipment, etc. and *auxiliary facilities,* e.g. dormitories, cafeterias and the like. The latter category of facilities is generally of less frequent occurrence and should therefore be dealt with separately. Wherever possible, a distinction should also be made between the various levels and types of education, as they may very well exhibit essential differences in this respect.

J:3 *Loans, repayment and interest charges, related to educational expenditure.* This type of information also deals with capital investments for education, but as distinct from the previous item, which concerns investments directly paid for by the relevant authorities, here we are concerned with investments financed by loans. Data are needed about the yearly costs to the various public authorities for debt services, that is to say amortization and interest payments, relating to investments for educational purposes. As for classification principles, reference may be made to the previous item. Finally it should be mentioned that a certain risk of confusion between the two items J:2 and J:3 may sometimes arise, and that a check should be made so that where debt services are reported under J:3, the total amount of the loan must not be included under J:2, because that would mean double counting of the cost for one and the same construction project.

J:4 *Private expenditure for education.* The preceding three items have related only to expenditure by public authorities, which means that expenditure for private educational institutions is left out, with the exception of cases where expenditure for the operation of private schools is met to a certain extent by subsidies from governments and other public bodies, already included above. To fill this gap in the information, private schools should be required to provide the central educational authority with appropriate data about their expenditure, reporting at the same time the amount of public subsidies received.

Besides the operational costs for public and private schools there is another type of expenditure related to education, namely various costs incurred in sending children to school, which are borne by parents, e.g. school books, supplies, transportation, lodging, etc. Such additional private expenditure is also of interest in planning educational programmes, but as a rule very little information is available in this respect. It might, however, be possible to collect data of this kind by means of sample surveys of households. A clear distinction should be made between school fees and other educational costs paid by parents. The fees are mainly related to the operation of private or, occasionally, public schools, and are therefore normally included in the expenditure of such schools.

Conclusion

This chapter has outlined some types of statistical data needed for educational planning. The utilization of these data for educational planning falls within the scope of educational planning itself. It is evident, however, that the statistical analyst can do more than furnish descriptive statistics about the educational system.

Statistical analysis, through the inter-relationships of the various data enumerated, can focus upon certain strengths and/or weaknesses in the educational system. The analyst can also demonstrate trends and changes observed up to the present time and, within limitations, project future tendencies. Further, together with the educational planner, he can apply various hypotheses and project the quantitative consequences of such hypotheses and/or assumptions.

Some of the inter-relationships that serve the educational planner are quite fundamental. Demographic and pupil statistics, for example, relate the application of formal education to the age-group 'eligible' and thus are essential in determining the quantitative status of education in relation to the potential demand for education. The relationship between the labour force and the various types of education throws light upon the ability of the educational system to supply the human resources necessary. In conjunction with economic and financial statistics the direct role of education in economic development might be studied. Statistics of teachers and pupils together with educational testing data help measure the efficiency of the school system itself. Costs and economic data show the investment in education related to the economic capacity of the society and can help set a target for future educational investment.

These are but a few of the numerous possibilities for fruitful statistical analysis for educational planning. Thus, although many of these statistics are not 'educational statistics' in the narrow sense, it must be remembered that the process of educational planning does not operate in an 'educational vacuum'. In deciding what data to collect, the statistician must take into account all the factors relevant to educational planning.

Chapter XI

Project analysis and programming for international financing[1]

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General planning can achieve its ends only to the extent that it is followed by programming and operation.[2] In practice the main part of the programming must be undertaken before project analysis is possible. On the other hand the principles inherent in project analysis must be borne in mind during programming.

In order to establish programmes and to undertake operations it is first necessary to identify 'projects' which can be operated as units while still part of the total programme. For our purposes a project may be any activity which can be developed as a unit in order to achieve a defined objective. It may be a single educational institution or it may cover several institutions and services which together make up a defined programme. (It will be possible in this document to consider only those projects which are institutional and undertake teaching programmes.)

Project analysis and appraisal allows examination of the purpose, justification and feasibility of a project. It is an evaluative process which identifies the strengths and weaknesses of a proposed project and leads often to its reformulation in a more acceptable or more feasible form.

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[1] The writer is considerably indebted to official and informal statements by the International Bank for Reconstruction and Development for points made in this chapter. Modifications made to Bank statements, where they have been used, are the writer's attempt to fit general considerations to the specific needs of educational projects.

[2] The terminology used in this chapter conforms to the usage of English economists, i.e. 'planning' is considered to be the process establishing the broad lines of development; 'programming' is the next stage which establishes the specific details of a project, makes detailed financial estimates and provisions and integrates the project in the more general plan with which it is associated; 'operation' is possible on the basis of the programming.

There is no mystique about project analysis or programming; they are simply the application of accepted administrative and financial principles[1] to a particular situation in order to assess and establish an operational programme.

All projects which are part of a plan require analysis before they can be incorporated finally in educational programmes and budgets. In this paper we are particularly concerned with the preparation of project analyses and programmes as a basis for international financing; this introduction of outside assistance requires that particular attention has to be given to some factors. It will be clear, however, that almost all the same processes are required when a project is being prepared for inclusion in a national programme and budget.

A project may have any one of a wide variety of forms and, for particular cases, the suggestions below can only be indicative; they will need adjustment to specific situations.

How the analysis is presented

When a project is prepared for inclusion in an education programme or for submission as a case for financial assistance, it has to be presented in a document or series of documents which describe the project and the analytic processes which have led to its form. In preparing this document it is necessary to consider the uses to which it will be put. Among the likely uses the following are some of the most important:

1. It will be scrutinized by the Ministry of Finance and other government agencies in order to determine budgetary allocations.
2. It must be approved and used by the authorities which centralize the implementation of national plans for economic, social and educational development; it must be approved by the body which co-ordinates foreign assistance to the country.
3. It will be scrutinized by external financing authorities as a basis for decisions respecting grants or credits.
4. It will be continuously referred to, during the operational life of the project, as a control against which progress is measured. (Before project operation, the document may be partially replaced by a Plan of Operation—e.g., for a United Nations Special Fund project—

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[1] It is no part of this study to deal with the principles of public administration but it will be clear that extensive knowledge and experience in this field are essential attributes of the official concerned with educational planning.

or a credit agreement—e.g., for a project financed by the International Development Association—but the original document still should contain all the essential elements of the eventual agreements.)

5. It will be used as the starting point for subsequent revision of the project, either to meet the requirements of financing agencies, or to change details of the project in order to take account of developments and changing situations.

In preparing such a document it is essential that its form, content and timing should take into account the legislative framework in which the programme is to be established. In order to meet the purposes enumerated above, all of the points discussed in the remainder of this chapter should be considered in preparing the document. In addition, the writer has considered some of the likely requirements of national legislation, etc., but in particular cases, only local knowledge can suggest the full range of controls needed.

Identification and justification of a project

Other chapters of this manual have considered the factors which are relevant to planning and they need not be repeated in detail here. However, in preparing a project for international financing it is necessary to repeat the reasons for the existence of the project as these form one of the bases for decisions by external authorities wishing to evaluate the project. A project analysis must therefore include detailed statements covering the following points.

Justification of the project and its background

Financing authorities will want to know the history of the project, results already achieved, and the reasons for the proposed development. If the project is part of an over-all educational plan a considerable part of its justification will be covered in the plan document and may simply be reproduced. But, in any case, the justification needs to take account of the following factors (for the sake of illustration it is assumed that the project is concerned with a teaching institution or group of institutions):

1. The need for the project within the present educational facilities of the country and in relation to the education development plan.
2. The contribution of the project to economic and social development.
3. An estimate of the manpower demands which establish the need for the proposed education or training. (N.B. Pure manpower considerations may not be the only, or even the major justification.)
4. Cost of the project relative to alternative forms of training if alter-

natives exist (e.g., if it is proposed to establish a university faculty with a comparatively small number of students, would equivalent training abroad be less expensive? Or if more expensive, are there other factors that make external training desirable?).

5. Reasons why the project should be given priority (taking into account educational and economic factors which may have been covered in 1 and 2 above).
6. External financial assistance may need to be justified in terms of currency requirements or balance of payment problems. The use of foreign currency or reserves (e.g., to hire foreign experts, buy building materials, equipment, etc.) may be an additional justification for seeking external assistance.
7. If technical assistance is provided, or is to be provided in the fields related to those in which financial assistance is sought, such financial assistance may be justified in order to make effective use of the technical assistance available.

These factors together should indicate how the project will contribute to education, social and economic development and show that it falls within the framework of consistent educational and economic policies.

Feasibility of the project

Many projects may be educationally or economically desirable but not feasible for any of a number of practical reasons. A project analysis must check that all reasonable operational requirements can be met and can be met in accordance with the proposed timetable. For educational projects the following will usually be the main factors to be considered in assessing feasibility:

Economic feasibility. The place of the project in the economy and its priority will usually have been established in justifying the project. It may remain to be shown that the existence of the project will not place a strain on the economy as a whole, e.g., in the case of training projects that students will not be drawn from other forms of high priority training, that the output will not produce an educated unemployed of serious proportions, that the project will not place a strain on essential services required for other activities, etc.

Educational feasibility. Since the project will be an educational activity, it can be successful only to the extent that it is conceived in sound educational terms. It is necessary to decide whether or not the project as proposed will indeed produce the desired quality and level of education aimed at. This is an educational decision which can be made by educators on the basis of experience and knowledge of the system. An important factor in this area is the placement of the project within the system—does it articulate with types of schools which can provide the level of input needed? Is it in harmony with the over-all conceptions of the education system?

Internal organization of the project needs examination in order to reach assurance that the programme can be followed with the facilities available and that the proposed syllabus is adequate for the purpose of the project and in conformity with recognized standards—national or external.

Availability of staff. It is obvious that no educational programme can be successful unless qualified and suitable experienced staff are available. If local staff are not immediately available and it is proposed to use foreign staff in the early years of the project it must be certain that local staff can be trained by the time the foreign staff leaves. The quality and suitability of available staff is one of the most difficult things to assess in advance—for this reason it is a question which requires the most careful attention. Within this group of problems the availability of personnel, capable of assuming leadership and direction, is of first importance.

Organizational feasibility. The analysis of the organization of a project requires a detailed study of the programming (discussed below). Suffice it here to note that a project is feasible only to the extent that building timetables are realistic, students are available in sufficient quality and numbers, services are provided, the organization fits into that of the national education system, co-operative relationships are established with industry (in the case of industrial training), agriculture (for agricultural training), and so on. Every item of the proposed organization needs to be checked against the likely availability of resource at every stage.

Utilization of output. The quality of the output of a project (usually graduated students in educational projects) is the measure of its achievement. Most often it is necessary to measure the success of a project in terms of the *employment* of its product even though immediate economic consideration may not be the prime motive for training in some cases. Some educational projects may not directly produce graduates, e.g., the production of teaching materials, laboratory equipment, etc. But in any case, the analysis of a project will require the careful scrutiny of the anticipated output in order to ensure that it will be such as to meet the purposes for which the project was established. Project appraisal either as a planning exercise or as an evaluation from the point of view of investment, must consider the nature of the output and the document describing the project demonstrate that it is possible to use the output of the project in order to help economic or social development.

Financial feasibility. When the total budget of a project is established on an annual basis for a fixed period (for educational projects for which external financing is sought this will rarely be for less than five years) the proposed sources of finance should be identified at the same time. In general, foreign assistance is available only for part of the costs of a project and the government is expected to find the remainder. A first task in examining the proposed sources of finance is to consider whether a reasonable proportion of the total is to be met from local sources. These should usually pay for local costs (staff, running costs, local materials, etc.), often for building costs (though external loans may sometimes be used to meet such capital costs), and sometimes for the partial costs of external assistance (which may be considerable in some cases). Foreign finance is most usually available for the major costs of foreign personnel, for the cost of imported equipment, for the costs of overseas training of nationals who will replace temporary foreign staff; sometimes it is available also for capital costs. The proposals for financing a project have, therefore, to be assessed both on the basis of provisions in the local budget and in terms of the rules governing the provision of external finance.

For projects which are operated with external financial assistance, a most important requirement is that the country itself should be able to take over full financial responsibility when foreign aid ceases. No external financing authority will consider granting assistance unless it is clearly demonstrated that the government, or some other internal authority, will be able to assume full financial responsibility for the ongoing activity of the project after foreign aid is terminated. This process can be made easier by a gradual tapering off of foreign aid, with consequent regular increase of government or other internal participation, so that the assumption of full responsibility by the local authority does not involve too great an increase in the local budget when outside assistance stops.

Identification of the project

In determining whether a project may be suitable for international financing, it will be necessary to seek advice from representatives of the financing authority[1] in the country concerned. The identification should

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1. Some important points of contact are: for assistance from the Agencies in the United Nations family, United Nations Special Fund, and United Nations Expanded Programme of Technical Assistance, the Resident Representative of the Technical Assistance Board; for assistance from IBRD or IDA, the National Ministry of Finance or National Planning will have the necessary informations for bilateral programmes, embassies and aid missions usually exist in requesting countries.

be made within the framework of an over-all educational plan. The fact that a project is part of a broad plan is an important part of its justification: the justification becomes more difficult if such a plan does not exist. The project description should not only show the place of the project in the national education plan but should also explain how its place in the education plan is related to broader national plans for economic and social development.

The identification of the project requires an exact statement of its purpose and aims. These may be set out fully in the over-all education plan but it is more likely that for the purposes of project analysis the aims will need refining and clarification. If, for example, the project were to be the expansion of secondary teacher training, the stated aims should clearly cover at least the following: the need for the trainees; the place of the project in national plans; the type and level of training required; anticipated input and output of students; date of commencement and rate of growth; maximum training rate to be achieved and date of achievement. If the location and other factors are already established, these should also be included. The operation of many education projects causes consequential increases in costs in other parts of the education system, and in other avenues of government expenditure. For example, increases in primary education make for increased demand for secondary schooling, increased secondary enrolments step up the demand for university education, high-level agricultural training presupposes increased employment by the Ministry of Agriculture, and so on. The most important of these chain reactions for an eventual Ministry of Education expenditure is the effect of the training of teachers. Graduates from teacher-training colleges usually go on to the government payroll and the increase in the salary bill is rapid and continuous. An important point in the analysis of a project is to ensure that the output of the project will not be so great that its use will increase recurrent expenditure beyond the likely availability of resources. This and other aspects of the economics and financing of projects can best be checked with the Ministry of Finance, the Ministry of Planning or equivalent departments. A project description which is used as a basis for financing from within or without the country is not complete unless it indicates the agreed sources for the financing of consequential recurrent expenditure.

Criteria for external financing

The criteria applied by financing agencies vary widely—depending on the agency, on whether grants or loans are involved, on the national context in which their assistance is requested and so on. Many agencies do not publish the general conditions under which they are willing to grant aid and in specific cases the advice of agency representatives must be sought. However, the following general considerations (some repeated from above) may be assumed to be important in most situations and should be taken into account in project analysis and appraisal:

1. The requesting government must demonstrate the importance it attaches to education and to the project by providing a substantial proportion of the total cost of the project.
2. A particular project should be part of an over-all education plan and must have a high priority within the plan.
3. Immediate and consequential recurrent costs must be taken into account in present and future government budgets.
4. External assistance is more likely to be available to remove bottlenecks or to fill gaps in the existing system than to finance established and continuing projects.
5. Preference is likely to be given to those educational projects which will contribute most rapidly to economic development (preference for educational projects may be accorded in some cases where the immediate returns may not be as great as those from other avenues of investment but where the long-range benefit may be considerable and spread over an important sector of the economy).
6. Project requests will not normally be considered unless they are properly planned in all their human, material and financial aspects. Cost estimates must be well documented and there should be some analysis of the relation between costs and benefits (in so far as the benefits can be quantified).
7. The operation of the project itself needs to be supported by adequate administrative and technical services. Likely continuity of service of key personnel is an important factor in this context; if such key personnel are likely to move to other jobs is there a reasonable possibility of replacing them?

Project programming

The analysis of a project does not include programming but, on the other hand the analysis and appraisal cannot be effective unless a check is made on the programme details. It is therefore necessary to know the basis of the programming if an assessment of proposed project is to be possible.

In establishing a programme two main considerations must continually be borne in mind: the aims of the project and the limits of the resources available to carry it out. Good programming will aim at achieving the optimum results with minimum cost. It will ensure adequate quality but will avoid extravagances which give comparatively small returns. When a choice has to be made between alternative procedures, the proper choice is that which will achieve the best balance between cost and return. Analysis of the project will check such points and the design of the project must take them into account if its cost is to be approved by financing authorities.

The use of standards

The first task in the detailed design of the project is to establish the standards to be met. Some of these will already have been set by the aims of the project, e.g., lengths of courses, level of instruction, etc. Decisions such as the following have to be made in planning an educational institution (it is assumed that the required output, length of courses, etc., is known so that enrolment, total and by course, is fixed):

1. How many pupils per class?
2. How many pupils per laboratory or workshop? For how many hours per week, or year will they be in use?
3. How much classroom space, laboratory space, recreation space, circulation space, etc., per pupil?
4. What standards are to be used in determining the laboratory equipment to be provided?
5. How are library requirements to be established?
6. Specifications for boarding facilities (if required).
7. Level of fees which are economically feasible.
8. What auxiliary staff and services are reasonably required?

In seeking the answers to these and other questions the advice of specialists will be needed, and in drawing up building plans, laboratory equipment lists, specifications for furniture and so on, experts (including experienced teachers!) must be called in. In some developing countries expertise of this type is not available and it may be necessary to seek the advice and assistance of foreign experts or of foreign aid institutions. Many of the agencies which are possible sources of eventual finance are willing and able to supply such services.

Points to consider in the design of a project

These notes cannot possibly cover all the contingencies that may arise in designing an educational project. The following check list covers the main considerations in designing a single high-level technological training institution and it may be adapted to other types of educational institutions, or to groups of institutions. A rather different list would be required for an educational project which was non-institutional.

Administrative considerations

1. The place of the institution in the total education system—does it fit logically?
2. Lines of authority from the ministry to the institution, including provision for local, state and federal responsibility as appropriate.
3. The constitution and nature of the governing body; its authority and responsibility.
4. Does the institution have legal entity? Is any legislation required to allow it to operate? To requisition land or buildings?

Location

1. Where will the institution be, and why?
2. Where is it in relation to population centres, pupil supply, industry, transport, accommodation, electricity, gas, water?
3. What steps have been taken to acquire the site? Local authorities, departmental and interdepartmental agreements?

Building programme

1. Are the specifications for building contracts complete? If not, where and by whom will they be prepared?
2. Is the component of imported materials a serious problem for financing?
3. Is the building timetable realistic in terms of local precedents? In terms of development pressure on the building industry?
4. Is the building design suitable for the operation of the project? Is there evidence of extravagance, wasted space, non-functional space? (If the local authorities do not make objective assessments of the justification of expenditure, external financing authorities certainly will do so.)
5. Does the building timetable meet requirements of enrolment growth, staff appointments, equipment supply?
6. Are local labour and materials to be used? If not, why not?

Requirements for admission and courses of study

1. Have detailed admission requirements been drawn up to meet the aims of the project? How do these compare with standards in the country and abroad?
2. Have study courses been prepared and checked against similar courses elsewhere? If they are not yet prepared, who will prepare them and when?
3. How are standards of graduation to be established and maintained? Are external examining authorities necessary or desirable?
4. Are timetables consistent with course requirements and available teaching space?

5. If details, such as above, are to be worked out later, when and by whom?
6. Are arrangements with local industry required to ensure fully effective training?

Enrolment

1. How many students per course per year? Where will they come from?
2. Rate of enrolment growth? Will this achieve the purposes of the project?
3. Are figures consistent with efficiency? Is enrolment sufficiently large or small to make costs per pupil reasonable?
4. Is employment or further education of graduates reasonably assured? What arrangements have been made with industry with respect to employment?

Staff

1. What foreign staff are required? Qualifications, arrival dates, and duration of stay?
2. Are suitable local staff available? Where from? What is estimated cost, in local currency and foreign currency?

Equipment

1. Is equipment proposed sufficient for training purposes? Are extravagant items included which are not essential in a training institution? Are lists inflated for reasons of prestige or for any other reason?
2. Are services available for the operation of equipment? Sufficient power, water, gas, etc.?
3. Have housing requirements for specialized equipment been taken into account in the building design?
4. Is there a timetable for placing equipment orders and for delivery? Does this tie in with the building, staffing and teaching timetables?
5. Is there adequate provision for teaching materials and supplies, office supplies, miscellaneous materials?
6. What arrangements are made for maintenance of equipment and spare parts?
7. Insurance of equipment and facilities? (Unless government undertakes auto-insurance.)

Finance

1. Have all costs been tabulated and analysed by year of expenditure, currency of expenditure, capital and recurring expenditure?
2. Have the following items of expenditure been taken into account? (There will be others which will be identified during the design of the project.)

   Buildings. Site acquisition and clearance; architectural services;

building construction; building maintenance; installation of services (electricity, water, gas); landscaping or other work on grounds; roading; drainage.

Equipment. Costs of equipment; transport and installation costs; library books and materials; maintenance and replacement costs; furnishing for classrooms, offices, recreation facilities.

Staff. Teaching staff—foreign, local; administrative and clerical staff; service staff; part-time consultants or advisers; local costs for foreign staff.

Fellowships or other forms of staff training. Fares, and travel costs, per diem; fees; salaries payable while abroad.

Other running costs. Electricity, water, gas; materials and supplies—teaching and office; garbage and waste disposal; insurance; transport—maintenance and running costs; rental; residential costs; examination costs (if external); sports and recreation; medical services; telephone, communications; rates, taxes.

3. From what sources are costs (identified by item and currency) to be met—fees, local government, state government, federal government, private sources, foreign assistance?
4. In the breakdown under 3, does each item of expenditure qualify for disbursement under the rules of the agency which is to be responsible?
5. Are national and total costs within limits set by national plans, by the budget authorities, etc.?
6. Have necessary steps been taken to ensure that costs are included in appropriate budgets year by year?
7. Is there a reasonable expectation that the proposed sources of finance will not 'dry-up' before the project is completed?
8. Has foreign assistance been tapered-off towards the end of the project so that the additional costs to be met from local resources in the first year of independent operation will not be too great?

When the programme for a project has been completed, taking into account such factors as those listed above, it may well transpire that it is necessary to make adjustments for reasons of budget, organization, practicability, etc. The project analysis described above will indicate whether and where adjustments are necessary. If the programming and analysis have been thorough there should be little difficulty in getting the project into operation on schedule. However, it would be foolish to expect that everything would go according to plan. It is necessary to keep the programme under continuous review during the life of the project and to make adjustments to forecasts of cost, organization, enrolments, etc., as they become necessary. Project analysis and programming is not a one-time effort for a particular project but is a continuing activity during its operation. The methods of approach remain the same.

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